B-24 LIBERATOR VS Ki-43 OSCAR

China and Burma 1943

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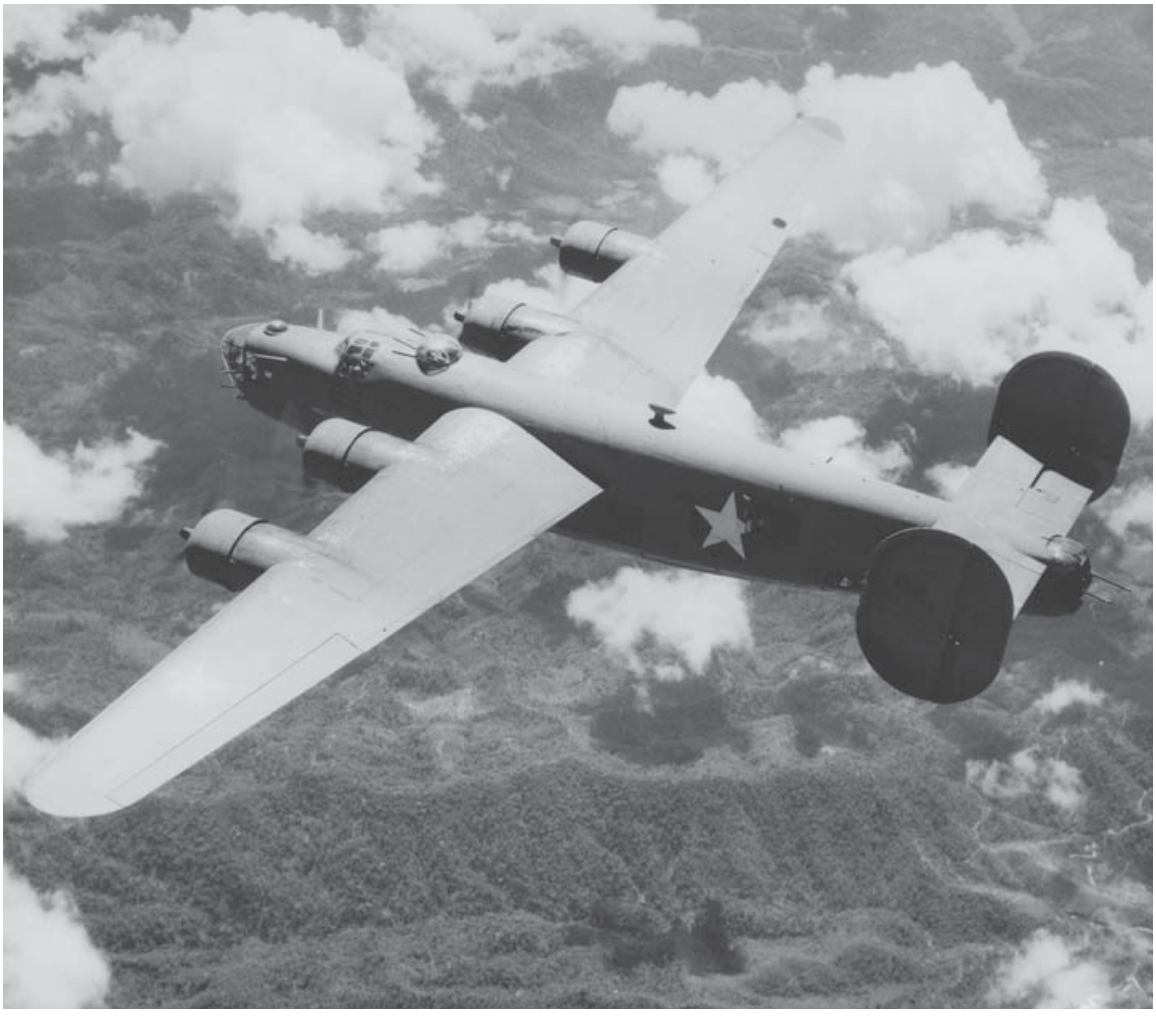
INTRODUCTION

The battles between the B-24 Liberator bomber and the Ki-43 Hayabusa (Peregrine Falcon) fighter in the skies over Burma and China represented a clash between American and Japanese air power doctrines. During the 1920s and 1930s the US Army Air Corps (USAAC) had adopted strategic bombardment as its primary mission. A greatly expanded US Army Air Force (USAAF) went to war determined to implement its theories of high-altitude daylight precision bombing as a means of winning the war. The Japanese Army Air Force (JAAF), in contrast, was a tactical air arm oriented to supporting the Japanese Army's ground forces in a war on the Asian mainland. In 1937 the JAAF adopted as its primary mission the destruction of the enemy air force and the establishment of air superiority over the battlefield.

Often, particular weapons emerge from the doctrine they are designed to implement. The Boeing B-17 Flying Fortress and the Consolidated B-24 Liberator came out of the USAAF's need for a well-armed, long-range heavy bomber to carry out its mission of strategic bombardment. To fulfill its mission of destroying an enemy air force the JAAF decided that it needed a pure air superiority fighter, deeming superlative maneuverability to be the primary requirement over and above all other considerations, including armament. The Ki-43 Hayabusa, officially the Type 1 Fighter, was designed to achieve air superiority.

Light in weight, with minimal protection for the pilot or fuel, and with limited armament, this quintessential air superiority fighter would be thrust into a role for which it was not equipped in 1943 – intercepting American B-24 Liberator bombers conducting a strategic bombing campaign. In the end, both sides would come away with lessons that contradicted their pre-war doctrines.

Doctrine relates to the methods a military force will use to achieve a particular military objective, usually based on past experience. In the development of strategic



A 7th BG B-24D flying over India in 1943. Japanese Ki-43 pilots soon learned that the Liberator's tail turret made attacks from the rear quarter a dangerous proposition. The preferred method was to approach from the front as not all the nose guns could be brought to bear on an attacking fighter. (3A-33754, RG 342FH, NARA)

bombing doctrine in the United States between the wars, there was little actual experience to build on. Belief in the efficacy of strategic bombing became more of a matter of faith and theory than an empirically tested reality.

During the mid-1930s, when for a brief period the capabilities of the USAAC's bombers exceeded the capacity of its older, biplane fighters, an argument emerged among the advocates of strategic bombing that bombers would no longer need an escort of fighter aircraft to get them to their target and return. A disciplined massed formation of bombers, using speed and altitude and relying on their own defensive armament, would be, it was assumed, almost impervious to attack. This belief came to be accepted as dogma. The USAAC Tactical School instructors maintained that "The well-organized, well-planned and well-flown air force attack will constitute an offensive that cannot be stopped."

Unescorted, high-altitude daylight precision bombing became standard doctrine, and it was with this doctrine that the USAAF went to war. When it set up the Tenth Air Force in the China–Burma–India (CBI) Theater, and later the Fourteenth Air Force

in China, a strategic bombing capability became an integral part of the air strategy in the CBI. Each air force was assigned a heavy bomber group flying the B-24 Liberator. The aircraft commenced bombing operations from bases in India at the end of 1942, followed by China in the late spring of 1943. In both the Tenth and Fourteenth Air Forces, the B-24 bomber groups started out flying unescorted daylight missions.

Throughout 1943 the Ki-43 Hayabusa bore the lion's share of the air superiority role both over the battlefield and in the air defense role in Burma and China. Prior to the entry of the B-24 into combat in the CBI, JAAF fighters had faced mostly smaller medium bombers such as Tupolev SB-2s in China and over the Nomonhan, Bristol Blenheims and Lockheed Hudsons over Burma and North American B-25s in small numbers in China. The B-24 posed a significant challenge to Ki-43 pilots, whose aircraft were armed with only two 12.7mm machine guns in the Ki-43-II model.

For many Hayabusa pilots, shooting down a Liberator proved to be a daunting task. The fighter sentais in Burma, who were the first to confront the B-24s in Asia, slowly developed tactics to cope with the big American bombers which they passed on to their compatriots in China. A single Ki-43 could rarely down a B-24 on its own, but in concert with other fighters, and with repeated passes, the chances of killing the crew or knocking out engines increased proportionately. The Ki-43 units in Burma and China went on to administer to the Liberator units the same lesson that the Luftwaffe was then imparting to the USAAF's Eighth Air Force over Europe

The 25th Sentai was one of the B-24's main adversaries in the skies over China, the unit re-equipping with the Ki-43-II in June 1943 in time to fight several intensive air battles with the Liberators of the 308th BG during August and September 1943. (Yasuho Izawa)

– American heavy bomber formations were by no means invulnerable, and that in the right circumstances, with the right tactics and a sufficient number of fighters, unescorted daylight bombing missions would result in prohibitive losses.

With all its limitations in armament, in massed formations the Ki-43 could inflict significant losses. But the ideal circumstances that the Ki-43 pilots had during most of 1943, facing unescorted bomber formations with an adequate number of attacking fighters, would not last. The experience of air combat forced the USAAF to abandon its doctrine of unescorted bombing and switch to the use of long-range fighter escort for almost all bombing missions. The JAAF, in turn, learned to its cost that its obsession with maneuverability at the expense of armament left it with a fighter that was incapable of dealing with heavy bomber formations once the USAAF could provide an adequate number of escorting fighters.

A 308th BG B-24D takes off over a line of P-40s from a base in China. The gasoline flown in from India aboard a single Liberator could fill the tanks of more than 20 Warhawks. Units equipped with P-40s provided China-based B-24s with much needed fighter escort whenever they could in 1943. (RG208-AA-Box 108, NARA)

CHRONOLOGY

1937

December The Koku Hombu (Air Headquarters) requests that the Nakajima Hikoki KK commences work on a replacement for the Type 97 Fighter (Ki-27), then entering service with the JAAF.

1939

January First flight of the Nakajima Ki-43.

January Consolidated begins work on the Model 32 bomber.

March 30 USAAC awards Consolidated Aircraft a contract for the XB-24 prototype.

April 27 USAAC orders seven YB-24s.

August 10 USAAC orders 38 B-24As.

December 29 First flight of the XB-24.

1940

August USAAC orders 408 B-24s.

September Final pre-production Ki-43 completed.

1941

January The Koku Hombu gives approval to Nakajima for production of the Ki-43 as the Type 1 Fighter.

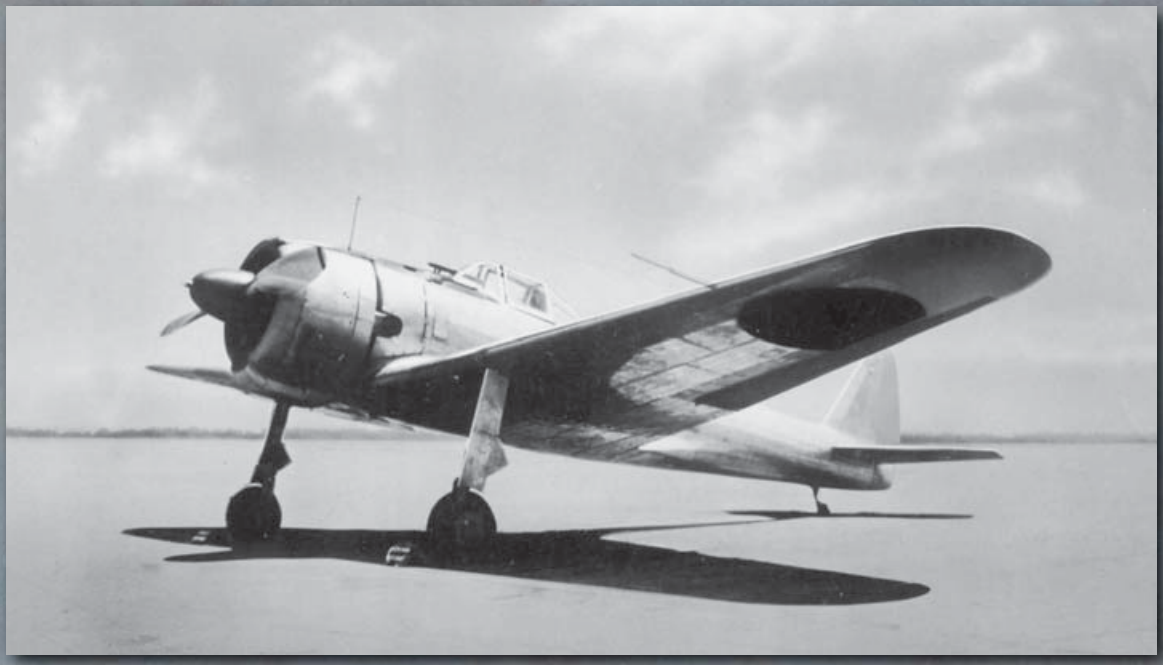
October Deliveries of the Ki-43 to the 59th and 64th Sentais begins.

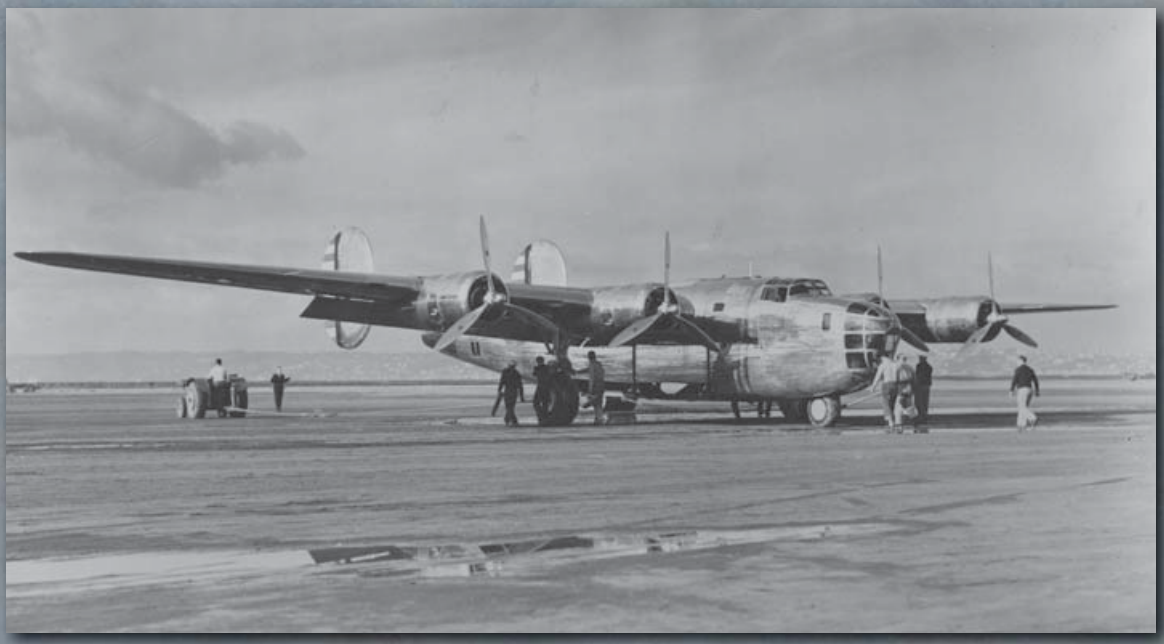
December 7 Japanese attack on Pearl Harbor signals the start of the Greater East Asia War.

1942

January 23 First B-24D delivered to the USAAF.

A heavily retouched photograph of the Ki-43-I Hayabusa prototype in 1939. The JAAF designated the aircraft the Type 1 Fighter, and it was given the codename "Oscar" by Allied air forces. However, most USAAF bomber crews in the CBI Theater continued to refer to the aircraft as the "Army Zero." (Author's collection)





The XB-24 is seen here at Lindbergh Field in San Diego, California, shortly before its first flight on December 29, 1939 – just nine months after the USAAC had signed a contract with the Consolidated Aircraft Company authorizing its construction. (3B-25232, RG 342FH, NARA)

February 12 Tenth Air Force established in New Delhi to control all USAAF combat operations in the CBI Theater.

October 7th BG in India begins to re-equip with B-24D.

1943

January 26 First combat over Burma between B-24s of the 493rd BS/7th BG and Ki-43s of the 50th Sentai.

March Fourteenth Air Force established in China under Maj Gen Claire Chennault.

March 308th BG transferred to Fourteenth Air Force.

March 13 Ki-43s shoot down two B-24Ds from the 9th BS bombing Rangoon, the first Liberator losses to Japanese fighters in the CBI.

May 8 The 308th encounters Ki-43s for the first time during a mission to Tien Ho aerodrome, Canton, China.

August 21 Two B-24Ds from the 308th BG are shot down over Hankow by 25th Sentai Ki-43s, these being the first Liberators lost to fighters over China.

August 24 During a return mission to Hankow, Ki-43s from the 25th and 33rd Sentais shoot down four out of seven B-24Ds from the 425th BS.

September 15 Ki-43s shoot down three out of five 373rd BS B-24s targeting Haiphong. A fourth bomber, heavily damaged, crashes at Kunming.

November 14 7th BG loses three new B-24Js to Ki-43s from the 50th Sentai over Pakokku, Burma.

November 27 308th BG, on a joint mission to the Insein railway workshops in Rangoon with the 7th BG, loses two aircraft to fighters.

December 1 On the third joint mission to Rangoon, Japanese fighters shoot down five B-24Js from the 7th BG and one from the 308th BG in the last daylight raid on the city.

DESIGN AND DEVELOPMENT

B-24 LIBERATOR

In the autumn of 1938, Maj Gen Henry "Hap" Arnold, newly appointed Chief of the USAAC, asked his friend Reuben Fleet, President of the Consolidated Aircraft Company, to consider having his firm become a second source for the production of the Boeing B-17. Fleet sent I. M. Laddon, Consolidated's chief engineer, and C. A. Van Dusen, production manager, to Seattle to meet with their counterparts at Boeing. Laddon and Van Dusen returned to Consolidated's headquarters in San Diego, California, to report that there did not seem to be enough work at Boeing to justify setting up a second production line, but more importantly with the conviction that Consolidated could build a better bomber than Boeing's now four-year-old design.

For some months Consolidated engineers had been working in secret on the design of a strategic bomber at the instigation of the French *Armée de l'Air*. However, when this effort did not result in the issuing of a contract, the company shifted its attention to the development of a proposed twin-engined flying boat, the Consolidated Model 31, which Consolidated planned to offer to both the US Navy and to civil airlines.

Searching for a bomber that would complement the Boeing B-17 while boasting a superior performance to experimental foreign designs, the USAAC had under consideration a requirement for a new four-engined bomber with a top speed of 300mph and a cruising speed of 220mph, ceiling of 35,000ft, a four-ton bomb load and an operating range of 3,000 miles.

On January 12, 1939, President Franklin Roosevelt, in his message to Congress on national defense, called for $300,000,000 to be appropriated for the purchase of 3,000

The XB-24 in flight, showing the tail gun position – a defensive improvement over the early models of the Boeing B-17. From nose to tail, the XB-24 had seven gun positions that were equipped with a mix of hand-held 0.30in. and 0.50in. machine guns. (3B-25248, RG 342FH, NARA)

new aircraft for the USAAC. Shortly thereafter the USAAC asked representatives of Consolidated to visit Wright Field to discuss its proposal for a new bomber.

Fleet and Laddon decided to go forward with an entirely new bomber design to meet the USAAC's specifications, utilizing work that Consolidated had already done. When developing the Model 31 flying boat, Reuben Fleet and I. M. Laddon decided to incorporate a completely new wing design using an aerofoil that independent aeronautical engineer David R. Davis had developed and patented. The Davis wing promised high lift with less drag and exceptional efficiency greater than the standard National Advisory Committee for Aeronautics (NACA) aerofoil designs – an ideal solution to the USAAC's requirement for long range and high cruising speed.

Consolidated's engineers under I. M. Laddon rapidly worked up a design for a four-engined bomber using a long, narrow Davis wing combined with the large twin fin and rudder configuration of the Model 31, the latter providing greater stability in flight. To maximize bomb-carrying capacity and to facilitate bomb loading, Laddon placed the wing relatively high on a deep, box-like fuselage which had two separate bomb-bays, each capable of carrying the same amount of bombs as the B-17's single bomb-bay. A tricycle landing gear allowed higher take-off and landing speeds.

During February I. M. Laddon and his team traveled to Wright Field with the preliminary design and engineering data for the new Consolidated Model 32 bomber, while engineers back in San Diego built a mock-up and completed wind tunnel tests on the design. USAAC engineers at Wright Field made recommendations for some 30 changes to the design, but approval quickly followed. On March 30, 1939 the USAAC awarded a contract to Consolidated for the construction of a prototype of the XB-24 bomber. A month later, following approval of the USAAC's Expansion Bill, the former placed a further order with Consolidated for seven YB-24 service test aircraft. On August 10, 1939, while the XB-24 was still under construction, the USAAC gave an $8,485,000 contract to Consolidated for 38 B-24As.

OPPOSITE
B-24D-25 41-24293 *"SHERAZADE"* served with the 425th BS/308th BG at Kunming, in China, for much of 1943. Named after the heroine of the popular 1942 film *Arabian Nights*, this aircraft was one of the original B-24Ds brought to China by the 308th BG in February 1943. On August 24, 1943, *"SHERAZADE"* was the lead ship in a formation of seven B-24s from the 425th BS sent to bomb Hankow. Maj Horace Foster was the pilot and Lt Donald Kohsiek his co-pilot on the mission. The attacking "Oscars" from the 25th and 33rd Sentais made repeated passes against the formation, shooting down four B-24s and damaging the rest. *"SHERAZADE"* was hit in the bomb-bay, right wing and fuselage and Maj Foster was mortally wounded. Despite leaking oil and fuel, the bomber was coaxed back to the American airfield at Hengyang, where Lt Kohsiek made a landing without brakes. *"SHERAZADE"* was repaired and flown back to Kunming, only to be destroyed in a crash landing on January 25, 1944 at Chabua, in India, after completing a flight over the "Hump."

The initial USAAC contract called for Consolidated to conduct the first flight of the XB-24 within nine months. Work on the new bomber progressed rapidly, helped by the first flights of the Model 31 which proved the benefits of the Davis wing. During the third week of December Consolidated rolled out the completed prototype, and on December 29, 1939, company test pilot Bill Wheatley took off from Lindbergh Field in San Diego on the bomber's first flight – two days before the USAAC deadline.

The XB-24 was powered by four Pratt & Whitney R-1830-33 Twin Wasp engines with mechanical superchargers. The large bomb-bay area with roller shutter doors could accommodate up to eight 1,000lb bombs stacked vertically. Armament on the XB-24 was intended to comprise a mix of hand-held 0.30in. and 0.50in. machine guns, with 0.30in. guns in the upper and lower sections of the nose glazing and two waist positions, and 0.50in. guns in the top rear of the fuselage, in the tail and also in a rear tunnel-gun position – a seemingly powerful combination for the time.

Flight tests during the first few months of 1940 revealed that the XB-24's Davis wing gave the USAAC's new bomber a longer range than the B-17, but the prototype's maximum speed of 273mph failed to meet both Consolidated's estimates and the customer's requirements. The USAAC duly decided to add turbo-superchargers to the XB-24 (re-designating it the XB-24B) and replace the prototype's Pratt & Whitney R-1830-33s with the more powerful -41 version of the radial engine, which with turbo-surpercharging provided 1,200hp at 25,000ft.

Contracts for Consolidated's new bomber followed soon after the first flight of the XB-24. In March 1940 the French Air Mission met with Consolidated representatives in New York, and shortly thereafter issued a letter-of-intent to purchase 165 Consolidated LB-30 bombers under the auspices of the Anglo-French Purchasing Commission.

In May, as the German Wehrmacht was overrunning France, President Roosevelt went to Congress to call for the production of 50,000 aircraft for national defense. By the end of the summer Congress had approved $5 billion in appropriations for defense, including a substantial increase in aircraft for the USAAC. The latter wasted no time, placing an $85,800,000 order with Consolidated for 408 B-24 bombers, as well as an identical order with Boeing for a similar number of B-17s.

With the fall of France in June, Britain took over all outstanding French aircraft contracts. The British government hurriedly negotiated an arrangement to take the

Delivered in 1941, the B-24A was the first model to enter service with the USAAC. Lacking power-operated turrets, the A-model Liberator was far from being a combat-ready bomber. Most were assigned to USAAC's Ferrying Command, where they pioneered flights across the Atlantic and around the world. (3B-25275, RG 342FH, NARA)

B-24D LIBERATOR

66ft 2in.

17ft 11in.

110ft 0in.

first six YB-24 service-test aircraft from the USAAC, which agreed to replace them with improved models being built under the former French contract. The six service-test aircraft, designated LB-30As, were delivered from December 1940. The USAAC also agreed to the further release of 20 B-24As to the British as LB-30Bs, which the Royal Air Force (RAF) designated as Liberator Is.

The LB-30As were put into service on the transatlantic ferrying route, while some of the first LB-30Bs were assigned to RAF Coastal Command. The USAAC received its single YB-24 in May 1941, followed by nine B-24As during June and July. These aircraft retained the mechanically supercharged R-1830-33 engines of the prototype. The USAAC's newly formed Ferrying Command took over the B-24As.

The USAAC's doctrine of daylight precision strategic bombardment was based on the premise that a massed formation of bombers could rely on their defensive armament to fight their way to and from a target in daylight. In their book *Winged Warfare*, published in 1941, then Maj Gen "Hap" Arnold and Col Ira Eaker had written that "the greatest protection of the bomber, once it is discovered by enemy pursuit, lies in tight formation with the resultant grouping of defensive firepower."

Two years earlier, however, Arnold had initiated a thorough review of aircraft armament, writing to the Chief of the USAAC Material Division that, in his opinion, "there has been less advance and development made in aircraft armament and ordnance accessories for aircraft than in any other branch of the art." Reports from China and Spain indicated that bombers might be far more vulnerable to fighter attack than the USAAC had previously assumed.

Soon after the war in Europe began in September 1939, the Material Division began a study of the tactics used in actual combat. After several months there was a dawning realization that the armament of American bombardment aircraft was deficient, particularly to the rear quarter. In a remarkably frank admission the Material Division's Experimental Engineering Section wrote "it is the opinion of this office

Under pressure from Gen "Hap" Arnold, who was rightly concerned at the relatively weak armament of American bombers, the USAAC initiated a program to fit powered gun turrets to the B-17 and B-24. The D-model Liberator, delivered in January 1942, incorporated powered turrets in the tail and dorsal positions to provide improved defense of the rear quarter. Japanese and German fighter pilots would soon learn to switch their attacks to the front of the bomber. (3B-25383, RG 342FH, NARA)

that our bombers are in no better condition than the European bombers so far as defense is concerned."

Tests at Wright Field between a B-10 bomber and P-36 fighter seemed to indicate, in conjunction with military intelligence reports from China and Spain, that most attacks on bomber aircraft would be from within a 45-degree cone to the rear. The test flights concluded that, given high closing speeds, attacks from head on would be of little use – a conclusion that would have unfortunate consequences when American bombers went into combat a few years later. The solution appeared to be the substitution of manually operated single 0.30in. machine guns with power-operated gun turrets employing the more powerful 0.50in. machine gun.

At a USAAC conference in Washington, D.C. in December 1939, the conclusion was that bomber aircraft needed firepower to the rear that would equal that of an attacking pursuit, and that this had to be provided through multiple gun turrets. The development of power-operated gun turrets for American bombers assumed a new degree of urgency.

In this respect the new B-24 was as deficient as the Boeing B-17, but it was a deficiency that had to be quickly remedied if the Liberator was to be made combat worthy, which the first versions of the new bomber clearly were not. Within a few weeks of the XB-24's first flight consideration was already being given to improving the B-24's armament, with the suggestion that a power-operated gun turret replace the upper 0.50in. machine gun emplacement atop the fuselage. A few months later the French Air Mission, when in talks with Consolidated about purchasing the B-24, urged the company to develop a powered turret for the tail position.

For the proposed upper turret, in 1941 the Production Engineering Section at Wright Field turned to the Glenn Martin Company with a proposal to produce the powered turret that it had designed for its own B-26 medium bomber. When the Martin turret proved to be adaptable to the B-24, Consolidated designed a position just behind the flightdeck for it. This led to a re-arrangement of the navigator's station and plotting board, which was moved to a slightly lengthened nose compartment, adding just under 3ft to the length of the fuselage.

Consolidated itself was the source of a tail turret for the B-24. In January 1941 the company received funding for the development of an experimental turret for the tail position, the first versions arriving at Wright Field in September. Although not without problems, the Consolidated A-6 turret, as it was designated, was accepted and incorporated into the substantially redesigned B-24C.

In effect a pre-production version of the Liberator, the B-24C featured the lengthened nose to accommodate the Martin turret in the dorsal position, the Consolidated tail turret, a single 0.50in. tunnel gun in the rear fuselage, turbo-supercharged Pratt & Whitney R-1830-41 Twin Wasp engines and self-sealing fuel tanks. The turbo-supercharged engines finally brought the top speed of the B-24 over 300mph. Consolidated built nine C-models, the first of which was delivered in December 1941, before switching to the first mass production version, the B-24D.

By the end of 1941 the USAAF, as it had become, had 3,303 B-24s on order. With America at war within a year an additional 7,168 Liberators were hastily ordered. In

early 1941 the US government had set up a production pool to build the B-24 in quantity. With government financing, Consolidated built a new factory at Fort Worth, Texas, while Douglas Aircraft built a facility at Tulsa, Oklahoma. The Ford Motor Company was brought in too, erecting a massive complex at Willow Run, Michigan. In 1942 North American Aviation joined the production group, adding a factory at Dallas, Texas. Between 1940 and 1945 these combined factories completed a grand total of 19,256 Liberator bombers and transports and US Navy Privateer patrol bombers – more than any other American combat aircraft in World War II.

Some version of the Liberator would serve in every theater of war with the USAAF, the US Navy and the Commonwealth air forces. Ironically, the first version of the B-24 to see combat in USAAF service was the export-standard LB-30, 12 of which were hurriedly appropriated from RAF contracts and sent to Java in January 1942 with the 7th BG. But it was the B-24D, the first example of which was delivered on January 23, 1942, that together with the B-17 sought to prove the validity of the USAAF's faith in daylight precision bombing.

Ki-43 "OSCAR"

The JAAF's Type 1 Fighter, the Nakajima Ki-43 Hayabusa represented the apogee of the Japanese pilots' obsession with maneuverability. A view that one-on-one combat in the traditional dogfight with enemy aircraft was the fighter pilot's *raison d'être* combined with the Samurai tradition of seeking glory and honor in single combat are part of what lay behind this obsession. With superior maneuverability, a skilled pilot could place his aircraft in a position where he could inflict a terminal blow against his opponent, even with minimal armament. Within the JAAF there was some doctrinal support for this view.

As a tactical air force providing support for the ground forces, one of the JAAF's primary missions was to establish air superiority over the battlefield. Fighters with superior maneuverability would, it was believed, enable the JAAF to rid the skies of the enemy's attack, fighter and observation aircraft, and provide an umbrella for sister squadrons to observe and attack the enemy's ground units. This viewpoint was an outgrowth of the experiences of most of the combatants in World War I, as well as the tactical doctrines that the JAAF had absorbed from the French aviation mission to Japan in 1919–21. But it was also a view that did not incorporate the rapid developments in aircraft capability and armament that took place in the immediate prewar years.

The decade of the 1930s saw the progressive introduction of faster, sturdier and more powerful aircraft capable of carrying greater loads of bombs and armament at higher altitudes over longer distances. The all-metal monoplane became the dominant type in almost all the world's major air forces. The modern bomber began to incorporate more defensive armament, including in many cases power-operated turrets. Tactical aircraft also shifted to the all-metal monoplane format in many air forces.

The increase in speed and durability of potential opponents created a dilemma for fighter aircraft designers. Their creations would likely have less time to engage an enemy aircraft, while all-metal construction implied a need for a considerably heavier punch than the standard two rifle-caliber machine guns that were a legacy of World War I could provide. Faster speeds and heavier armament implied heavier, more powerful fighters with higher wing loadings and a consequent decline in maneuverability that required a switch in tactics to hit-and-run attacks. Air forces around the world struggled to come to grips with this problem, working against the constraints of parsimonious budgets, industrial capacity and entrenched and often conservative orthodoxy.

In England the RAF opted to retain the rifle-caliber machine gun, but to build multi-gun fighters in the form of the eight-gun Hurricane and Spitfire, while on the continent several air forces also began to incorporate multiple rifle-caliber weapons while exploring the potential of heavier-caliber machine guns and aircraft cannon. In the United States and Japan in the mid-1930s, however, official views on fighter armament remained conservative.

The JAAF was offered an alternative. In 1936 the Nakajima Hikoki KK (Nakajima Aircraft Company Ltd), one of Japan's principal military aircraft manufacturers, came up with an innovative machine in the form of the experimental Nakajima Ki-12, which pointed toward the future of fighter development. Based on a thorough study of the French Dewoitine D.510 fighter, which the Mitsubishi Company had imported into Japan for the JAAF and Imperial Japanese Navy (IJN) to study, Nakajima had designed the Ki-12 to feature an inline 690hp Hispano 12Xcrs engine, a 20mm cannon, retractable landing gear and two 7.7mm machine guns in the wings.

The Ki-12 presented the JAAF with one design path, but it failed on the more traditional criteria that the latter deemed most important – maneuverability. The Ki-12's sister aircraft, the Nakajima Ki-27, was chosen instead by the JAAF as its next fighter, this superbly maneuverable machine being ordered into production in late 1937 as the Type 97 Fighter. An all-metal monoplane with a radial engine, fixed landing gear and two 7.7mm machine guns, the Ki-27's performance during the China conflict did nothing to dissuade the JAAF from its steadfast belief in the primacy of maneuverability for fighter aircraft.

The Nakajima Ki-43 was intended to replace the older Nakajima Ki-27, the JAAF's Type 97 Fighter – this example was assigned to the 64th Sentai's 1st Chutai in 1938–39. To match the Ki-27's phenomenal maneuverability, as Japanese pilots demanded, Nakajima had to build a lightweight fighter with minimal armament. (64th Sentai Association)

OPPOSITE
This Ki-43-II of the 33rd Sentai was assigned to the 1st Chutai's flight leader, Capt Kiyoshi Namai, during the summer and autumn of 1943. He and his pilots were at Hanoi's Gia Lam airfield when five B-24Ds of the 373rd BS were detected approaching Haiphong on September 15, 1943. No fewer than 35 Ki-43s intercepted the unescorted bombers, one of the JAAF fighters being flown by future ace Kiyoshi Namai, who later recalled, "The B-24s had been detected by JAAF air surveillance posts on the border between China and Vietnam. We were led to them accurately by ground radio control. We intercepted them with the full strength of our sentai. I led the 1st Chutai against three B-24s in formation. Our Ki-43s attacked them obliquely from the front in good order. We set one of them on fire and the two survivors, trailing fuel or smoke, jettisoned their bombs and fled." Just one Liberator made it back to base. Namai, who subsequently saw combat in Burma, New Guinea and the Philippines, survived the war as the 33rd Sentai's joint ranking ace with 16 victories to his name.

The JAAF was not alone in its view. At a research meeting organized by the Mitsubishi Kokuki KK (Mitsubishi Aircraft Company Ltd) in January 1938, a month after the Ki-27 had been ordered into production, a combined group of representatives from the aviation industry and the military air services agreed that maneuverability would be the primary consideration for future fighter aircraft.

Thus, when the Koku Hombu (Air Headquarters of the Japanese Army) approached the Nakajima Company to begin work on the Ki-27's replacement shortly after having placed an order for the aircraft, the basic requirement was for a fighter that would be just as maneuverable, and with only a marginal improvement in overall performance. The new machine, which was designated Ki-43 and would become the Type 1 Fighter Hayabusa, would continue in the orthodox and accepted pattern of excelling in close-in dogfighting to the exclusion of all else.

As an advance over the Ki-27, it was intended that the Ki-43 would incorporate a retractable landing gear and, it appears, improved armament. Around the time that Nakajima was beginning work on its new fighter, the Army was searching for a medium-caliber aircraft gun, and apparently tested the Italian Breda-SAFAT 12.7mm machine gun. The Army found the Breda's 12.7mm 81SR cartridge impressive, especially the high-explosive incendiary version, and tried to adapt the weapon, but without success. Instead, in a remarkable piece of engineering, the Army adapted the US Model 1921 Browning M-2 0.50in. aerial machine gun in a scaled-down version to take the Italian-designed cartridge as the Army Type 1 12.7mm Fixed Machine Cannon (Ho-103). The fact that several pre-production Ki-43s were tested with an armament of two Ho-103 machine guns and the first production models were designed and fitted to take the weapon seems a good indication of the Koku Hombu's intentions.

Upgrading its new fighter to the heavier-caliber machine gun was a partial, if still somewhat conservative, response to the changing armament needs of fighter aircraft. In the context of 1938, when Nakajima was beginning work on the Ki-43 design, it was not an unreasonable approach. In respect to their weight of fire, two 12.7mm machine guns were roughly equal to four 7.7mm weapons, enabling Nakajima to avoid having to add weight and complexity to its design by incorporating wing guns.

An early-production Ki-43-I is seen here on the wing over Japan prewar. Meeting the JAAF's demanding requirements delayed production of the Ki-43 until well into 1941. As a result the JAAF went to war with only two fighter sentais equipped with the Type 1 Fighter. (Author's collection)

Ki-43-II "OSCAR"

It is interesting to compare the proposed armament of the Ki-43 to some of its contemporaries of the same period. The Italian Fiat G.50 and Macchi C.200 incorporated two nose-mounted 12.7mm machine guns, as did the Curtiss P-40, while the Messerschmitt Bf 109C/D boasted four 7.7mm machine guns and the Polikarpov I-16 four 7.62mm machine guns, making them all roughly equivalent in terms of weight of fire.

Although in many ways bound by conservatism and tradition, the JAAF was by no means oblivious to aeronautical developments in Europe and the United States, or to the air war in Spain, which was demonstrating that even modern bombers were vulnerable to multi-gun fighters. The United States and the Soviet Union – two of Japan's potential enemies – were introducing newer, more capable bombers. During 1939 the USAAC began a program of re-armament, placing orders for the Consolidated XB-24 heavy bomber and the Martin B-26 and North American B-25 medium bombers, while the Soviets introduced improved versions of their Tupolev SB and Ilyushin DB-3 medium bombers.

Then from May through to September 1939, the JAAF experienced intensive combat against the Soviet Red Air Force during the Nomonhan Incident on the Mongolian steppes. Although Japanese fighter units appeared to have achieved a stunning victory, claiming more than 1,000 communist aircraft destroyed (mostly shot down by Type 97 Fighters), the last few weeks of the conflict saw a series of hard fought battles with Soviet I-16 pilots who had learned to change their tactics against the more maneuverable Type 97s. Avoiding dogfights and employing their superior speed and diving ability in hit-and-run attacks, the Soviets also introduced later models of the I-16 with two ShVAK 20mm cannon in the wings that could fire at Japanese aircraft from a greater distance.

The experience of battle in the last phase of the Nomonhan Incident called into question the JAAF's pre-occupation with maneuverability. There were more than a few Japanese fighter pilots who demanded aircraft with more speed and power for climbing and diving attacks, as well as heavier armament.

With work on the Nakajima Ki-43 Hayabusa well underway, the Koku Hombu was not about to completely abandon the primacy of maneuverability, but it did begin to conceive of a dual track for its fighter development. On the one hand, the JAAF would have "light" air-superiority fighters, designed along traditional lines of light weight and limited armament for superior maneuverability to establish air superiority over the battle front, and a new category of "heavy" fighters that would sacrifice maneuverability for speed, strength and heavier firepower to serve as interceptors against the newer bomber aircraft that Japan's potential enemies were developing.

For its "light" fighter the Koku Hombu had the Ki-43 under development and Nakajima was instructed to continue work on this aircraft, which in its service trials had failed to demonstrate the required maneuverability of the Ki-27. The Koku Hombu then asked Nakajima to commence work on a new "heavy" fighter design, designated the Ki-44, which would be a radial-engined fighter optimized for speed and climb performance, rather than maneuverability. It was to be equipped with two 7.7mm machine guns in the nose and two 12.7mm weapons in the wings.

Designed concurrently with work on the Ki-43, the Nakajima Ki-44 was a response to the Koku Hombu's request for a "heavy" fighter, with improved armament, to complement the Ki-43 "light" air superiority fighter. (Author's collection)

At the same time, cognizant that in Europe almost all the recent fighter designs incorporated liquid-cooled engines, the Koku Hombu approached the Kawasaki Kokuki KK (Kawasaki Aircraft Company Ltd) to design a "heavy" interceptor fighter and a "light" air-superiority fighter around the Daimler-Benz DB 601A engine, which had been sourced from Germany. The new aircraft would be designated the Ki-60 and Ki-61, respectively. The heavily armed Ki-60, which had two wing-mounted 20mm cannon and two fuselage-mounted 12.7mm machine guns, proved to be a disappointment to many JAAF test pilots, but the more maneuverable Ki-61 held considerable promise. Production of the latter as the Type 3 Fighter began in the summer of 1942.

After prolonged testing the JAAF finally adopted the Nakajima Ki-44 as the Type 2 Single Engine Fighter in September 1942.

The Koku Hombu also approached the Kawasaki Aircraft Company to design a "heavy" interceptor and a "light" air-superiority fighter around the German DB 601 liquid-cooled engine. The heavily armed Ki-60 "heavy" fighter, shown here, was not developed further. Had it entered service, American bomber losses might have been considerably greater. (Peter M. Bowers Collection, Museum of Flight)

JAAF single-engined fighter production 1941–45							
	1941	**1942**	**1943**	**1944**	**1945**	**Total**	
Ki-43	157	616	1,347	1,070	0	3,190	Nakajima
Ki-43	0	0	199	1,682	748	2,629	Tachikawa
Ki-44	0	131	519	565	2	1,217	Nakajima
Ki-61	0	34	710	2,130	184	3,058	Kawasaki
Ki-84	0	0	24	1,904	1,485	3,413	Nakajima
Total	157	781	2,799	7,351	2,419	13,507	

Complementing the more traditional Ki-43, the JAAF now had a general-purpose air-superiority fighter in the Ki-61, which was more representative of a later generation of fighter design, and in the Ki-44 a specialized interceptor fighter. Unfortunately for the JAAF, the Japanese aviation industry proved unable to produce these newer fighters in sufficient quantity. Moreover, the concept of fielding a mix of "light" and "heavy" fighters proved to be untenable in combat. The JAAF found, too late and to its cost, that it needed an aircraft that was both maneuverable and heavily armed in order to combat the latest generation of Allied fighters. This meant that it had no choice but to rely on the Type 1 Fighter – an aircraft and a concept that was effectively obsolete even before it entered service. Ultimately, more Ki-43s were produced than any other JAAF fighter type (see table above for production numbers).

The Koku Hombu's insistence that the Hayabusa obtain the highest possible standard of maneuverability delayed the introduction of the Type 1 Fighter until just before the beginning of the Great East Asia War. The Koku Hombu finally gave Nakajima approval to begin production of the Type 1 Fighter only in January 1941. This in turn meant that when the JAAF went to war on December 8, 1941 only two fighter sentais – the 59th and the 64th – had re-equipped with the Type 1 Fighter. And even with an armament of two 12.7mm machine guns, which became standard for the Ki-43 once production problems with the Ho-103 machine gun had been ironed out, the Hayabusa was seriously under-gunned relative to its competition, with no room for further development.

In the nearly three years from the Hayabusa's first flight to its entry into service, Allied fighters had undergone a quantum leap in armament, with the RAF and the Soviet Red Air Force moving toward combinations of 20mm cannon and machine guns, and the USAAF and US Navy standardizing on a battery of six 0.50in. machine guns.

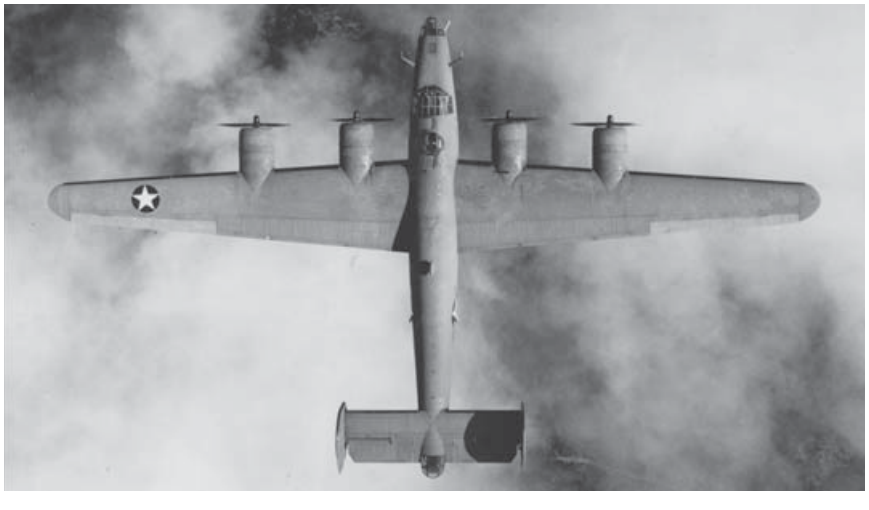
While JAAF pilots and the Hayabusa scored some notable successes in the early part of the war against equivalent fighters flown by less experienced pilots, once Allied aviators had adjusted their tactics to avoid close-in maneuvering combat, the ascendency of the Type 1 Fighter rapidly declined. In the hands of an experienced pilot the Hayabusa could still be a dangerous opponent, but success required almost ideal conditions, as the Hayabusa's combats with the B-24 over Burma and China would demonstrate – conditions that would not last as Allied fighter production soon exceeded and then overwhelmed Japan's.

TECHNICAL SPECIFICATIONS

CONSOLIDATED B-24 LIBERATOR

B-24D

The B-24D was the first version of the Liberator to be produced in quantity, and the first to be considered combat ready. The B-24's key features were its long, thin Davis wing, twin fin and rudder configuration, tri-cycle landing gear and four-sided modified elliptical fuselage, which Flying Fortress crews fondly described as "the box the B-17



The B-24D could boast a formidable armament, this photograph showing the bomber's main gun positions from nose to tail. The USAAF's mistake was to assume, based on pre-war flight tests, that most fighter attacks would come from the rear quarter. The nose armament on the B-24D proved to be inadequate in combat. (3B-25272, RG 342FH, NARA)

came in." Dimensionally similar to the B-17, the B-24D had a wingspan of 110ft and a length of 66ft 2in., but was some 7,000lb heavier at its recommended gross weight. While offering improvements in both range and bomb load over its Boeing counterpart, the Liberator ultimately proved to be a more demanding aircraft to fly, especially in formation.

The B-24D's fuselage was a semi-monocoque shell built from Alclad skinning, with Alclad longitudinal stringers, transverse bulkheads and belt frames for structural support. The fuselage was divided into six compartments – a nose compartment for the bombardier and navigator, a flightdeck for the pilot and co-pilot, a compartment behind the flightdeck for the upper gun turret and the radio operator, two bomb-bays measuring 17ft 10in. in length (double that of the B-17), a compartment aft of the rear bomb-bay for the waist gun and ventral gun positions, and the rear fuselage ending in a power-operated gun turret.

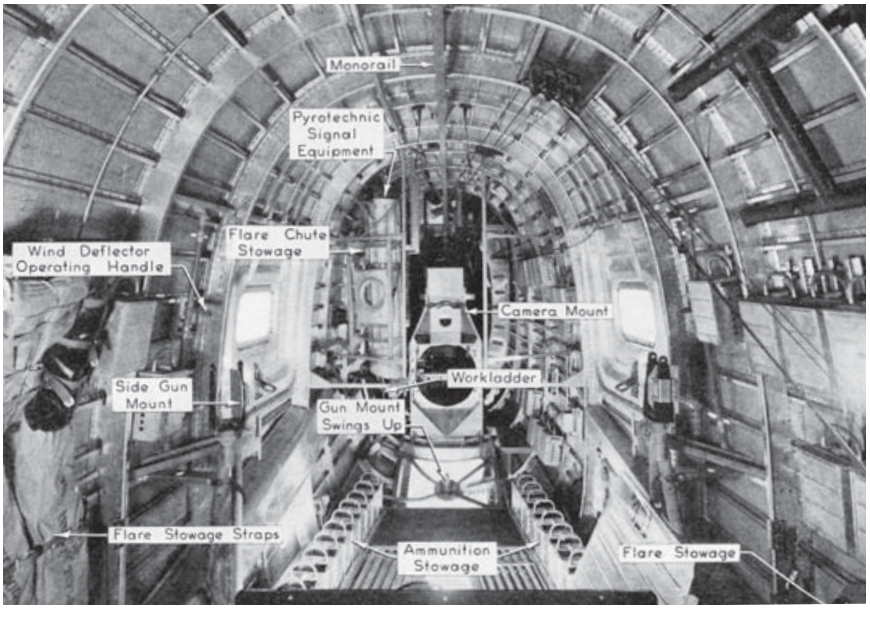
The flexible bomb-bay doors were made of corrugated Alclad welded to an outer Alclad skin. They could be rolled up on the outside of the fuselage to allow easier bomb-loading on the ground and opening of the bomb-bay in flight with minimal aerodynamic disturbance. A narrow catwalk through the bomb-bays connected the front and rear fuselage sections.

The high-aspect-ratio Davis wing was set at mid-level and built in five sections, with the large center section attached directly to the fuselage. Two outboard panels and two wingtip sections completed the wing. The B-24's wing incorporated two main spars, located close to the leading and trailing edges of the wing, which gave space for 18 self-sealing fuel tanks (nine in each wing) that could hold more than 3,000 gallons of fuel. Additional fuel tanks could be installed in the forward bomb-bay, extending the range, with minimal bomb load, to more than 3,000 miles.

Four Pratt & Whitney R-1830-43 engines rated at 1,200hp powered all but the late blocks of the B-24D. With the D-model, Consolidated shifted to turbo-superchargers for added power at altitude. This led to a change in the configuration of the engine cowls, which had an oval shape. The engines drove three-bladed Hamilton Standard Hydromatic propellers. Large fully retractable Fowler flaps provided high lift. Consolidated would build a total of 2,728 B-24Ds.

The Consolidated tail turret on the B-24D made a rear approach in a lightly armed and armored Ki-43 highly dangerous. During its service life the tail turret position on the B-24 went through a number of modifications in order to save weight. (7th BG(H) Historical Foundation, USAFA McDermott Library)

Armament on the D-model Liberator went through a series of changes during the production run. The first B-24Ds built at Consolidated had a single 0.50in. machine gun affixed to a ball-and-socket mount in the nose, a Martin A-3 dorsal turret with twin 0.50in. machine guns and a Consolidated A-6 turret with twin 0.50in. machine guns in the tail position. To provide additional protection the USAAF instructed Consolidated to install a Bendix remote-controlled lower turret, also with twin 0.50in. machine guns, on the underside of the fuselage aft of the rear bomb-bay. Aimed through a periscope, the Bendix turret proved to



A view of the interior of a B-24D looking aft, showing the right and left waist gun positions and the tunnel gun position in the floor. The tunnel gun replaced the remotely sighted Bendix turret, which proved to be unsuitable. Late model B-24Ds added a Sperry ball turret in place of the tunnel gun. (via Author)

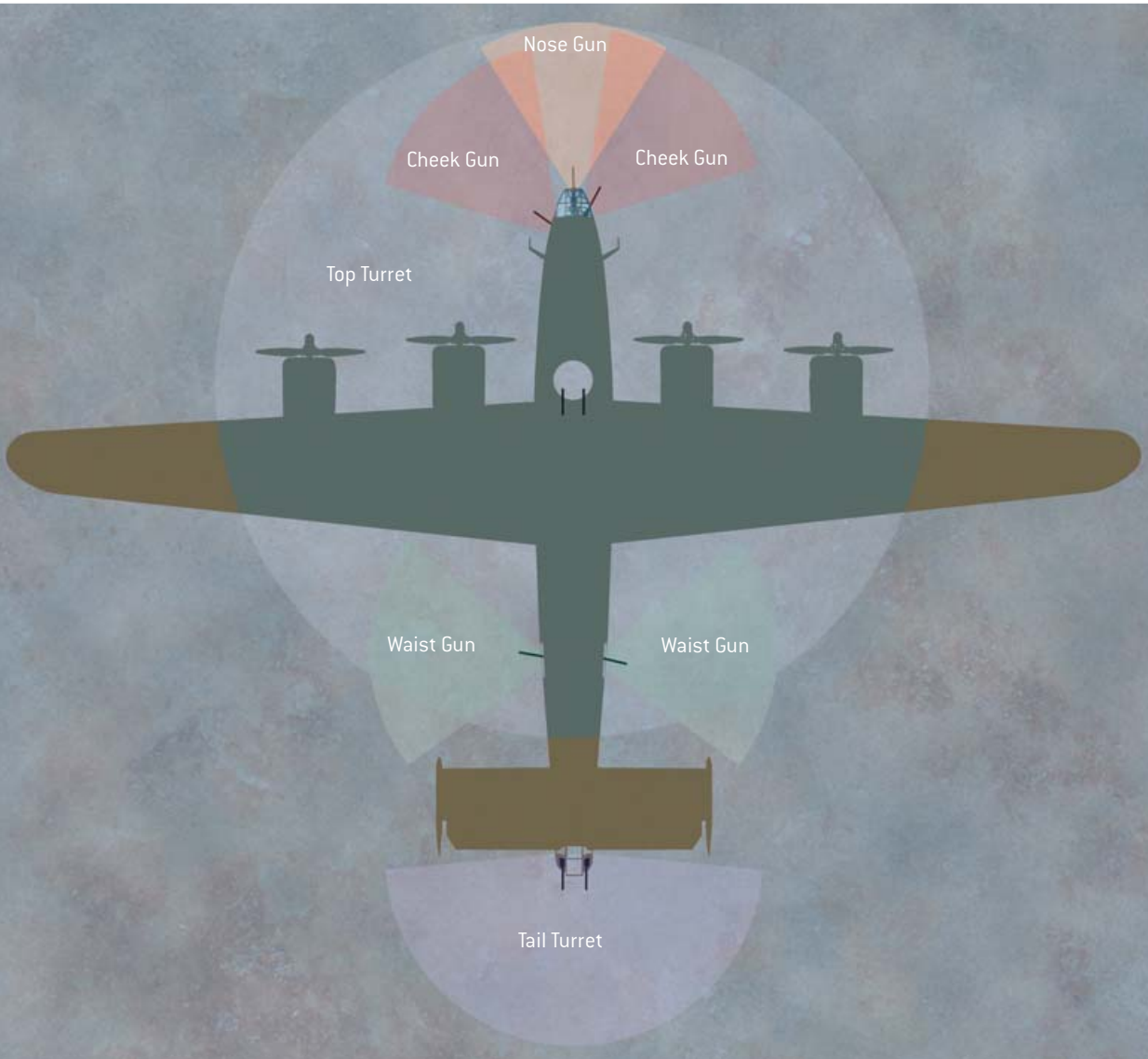
be less than satisfactory, and was soon replaced with a single 0.50in. tunnel gun. On later B-24Ds a Sperry A-13 ball turret with twin 0.50in. machine guns was installed in place of the tunnel gun. More guns were added in the nose and waist positions, two 0.50in. weapons being installed on each side of the glasshouse in the nose (later, these were moved aft and slightly staggered, each with its own sighting window) and flexible 0.50in. guns being mounted in the waist windows.

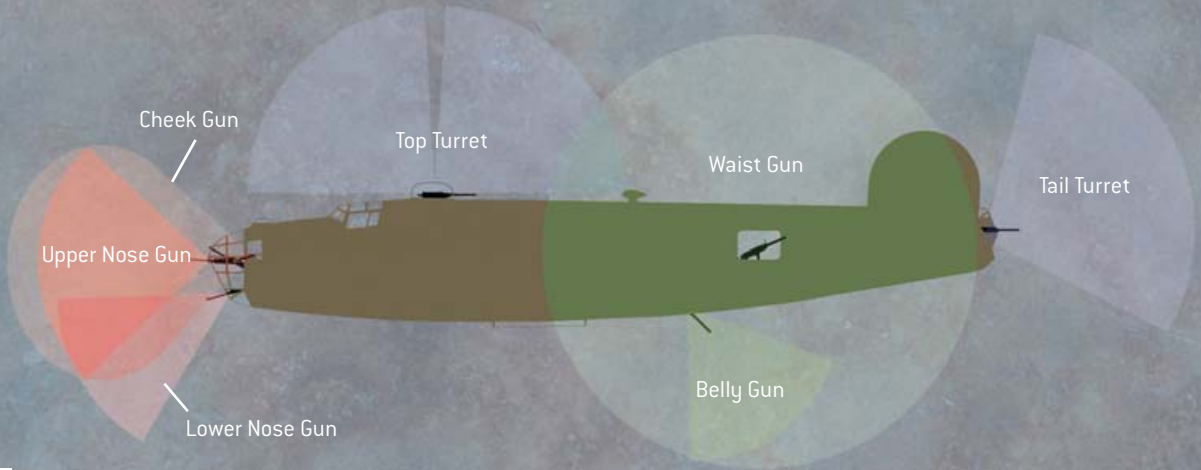
Combat experience soon revealed that the B-24 needed better armament in the nose, as the limited sweep of the three nose-mounted guns made the bomber vulnerable to head-on attacks. German and Japanese fighter pilots were quick to take advantage of this weakness once they had discovered it. Theater commanders in the field began to call for the installation of a powered turret in the nose of the B-24. While the USAAF's Material Command experimented with different nose turret configurations, the Fifth and Seventh Air Forces in the Southwest and Central Pacific chose the simple expedient of mounting Consolidated A-6A tail turrets in their B-24Ds as an interim measure. On later model B-24s, an Emerson A-15 nose turret often replaced the A-6A.

The standard 0.50in. nose gun positions on the B-24D are visible in this photograph of *BATTLIN' BITCH*, one of the original D-model Liberators assigned to the 308th BG's 375th BS. Although cramped, the nose compartment of the B-24D offered good visibility for the bombardier and the navigator. This particular aircraft flew on the August 21, 1943 mission to Hankow. (San Diego Air and Space Museum, 03-00640)

A drawback of the nose turret installation was the restricted vision the installation imposed on the bombardier and navigator. Although the B-24D's nose compartment was cramped and more difficult to work in than the B-17's due to it housing a bombsight and three 0.50in. machine guns, it had more room for the bombardier and navigator than later models. The glasshouse

B-24D ARMAMENT FIELDS-OF-FIRE





nose in the standard B-24D gave an excellent view, enabling the navigator to readily identify terrain features and the bombardier to pick up his target from a distance.

With the nose turret installed, the nose compartment became even more cramped. The bombardier had to get on his hands and knees and peer out of the observation windows under the nose turret to get a view of the approaching target. The navigator's view was severely restricted, consisting of small side windows behind the nose turret. The navigator could no longer assist the bombardier in identifying the target on the approach either. For bombardiers and navigators, the nose turret was an impediment, even if it meant increasing the B-24's defensive firepower. Thomas Sledge, who served as a bombardier with the 7th BG's 492nd BS in both D- and J-model B-24s, recalled that the latter was "a pain in the butt. There simply wasn't enough room."

In an effort to improve the B-24D's forward defense against Japanese fighter attacks, several crews in both the 7th and 308th BGs added a smaller 0.30in. machine gun in the upper nose of their bombers. One such machine to be modified was *"Bonnie Belle"* of the 425th BS/308th BG, which was lost in a mid-air collision in December 1943. (San Diego Air and Space Museum 00045859)

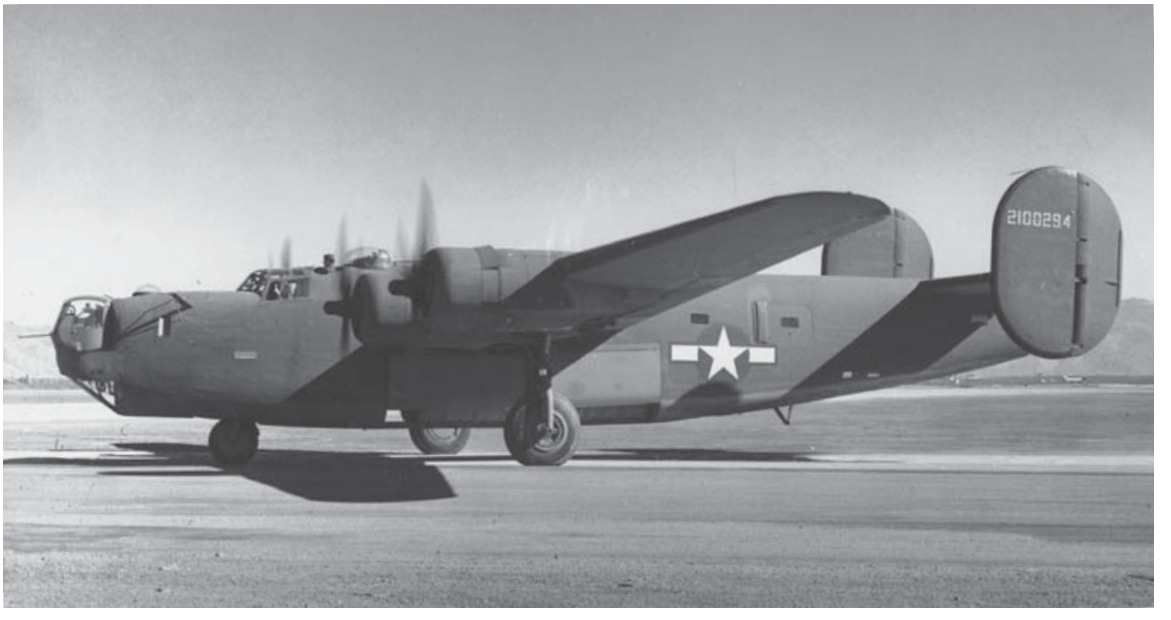
The B-24D's bomb-bays could hold up to 8,800lb of ordnance ranging from 20 100lb bombs to four 2,000lb bombs. Nominal range with a 5,000lb bomb load was 2,300 miles. Some of the early B-24Ds were equipped with the Sperry S-1 bombsight instead of the Norden M-series. The B-17 was given preference for the Norden until the latter could be produced in sufficient quantities. By 1943 Norden production had reached the point where the bombsight was standard equipment on the B-24D, and later models.

The USAAF took delivery of its first B-24Ds in January 1942. By the end of the year the D-model was in action in nearly every theater of war from Alaska to Africa. The B-24D made its combat debut as a heavy bomber on June 11, 1942 when five examples from the Eleventh Air Force bombed the island of Kiska, in the Aleutians. The next day, in one of the first demonstrations of the Liberator's range, 13 B-24Ds with the HALPRO (Halverson Provisional) detachment flew from Egypt to bomb the Ploesti oil fields in Rumania, covering a distance of nearly 2,000 miles. This mission was the USAAF's first attack on a European target and its first combat mission in the ETO and MTO. The B-24D's most famous mission, however, was Operation *Tidalwave*, the return to the Ploesti oilfields on August 1, 1943.

As newer models of the Liberator came into service the older B-24Ds were progressively withdrawn, although many continued on operations well into 1944.

B-24J

The B-24J was built in greater numbers than any other model of Liberator, with the production pool completing 6,678 aircraft during 1943–44. The J-model began replacing the B-24D in service in the CBI in November 1943. The B-24H had been



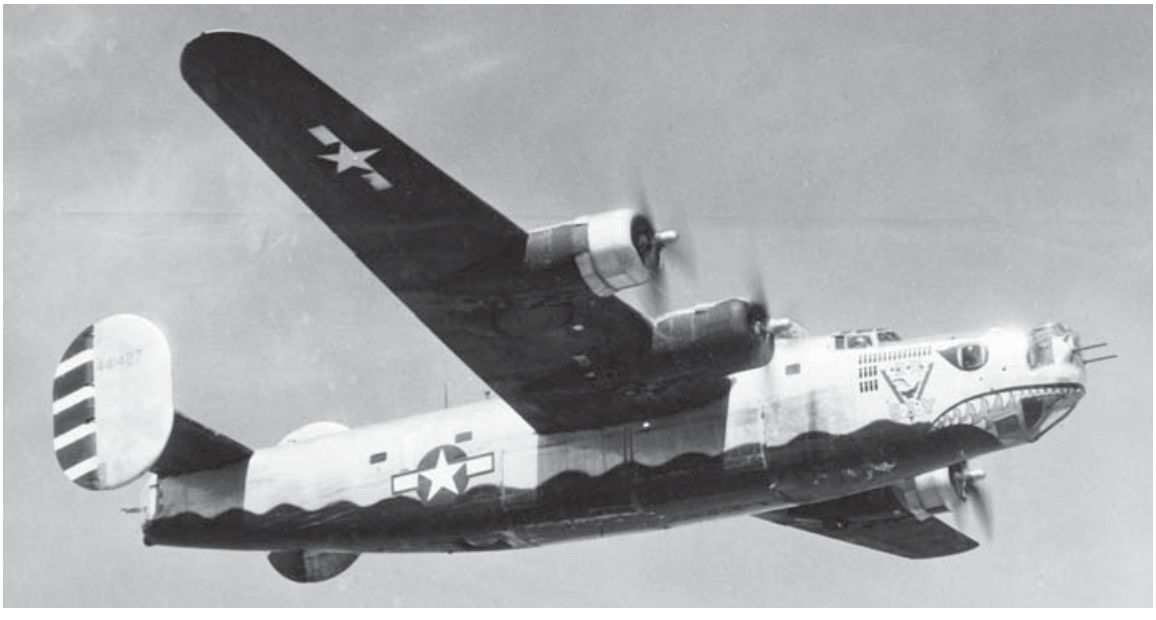
The answer to the Liberator's inadequate forward defense was to install a nose turret. Field modifications added a nose turret to the B-24D, while H- and J-models had one factory-fitted as standard. The B-24J replaced the B-24D in both the 7th and 308th BGs. (San Diego Air and Space Museum 00007709)

the first major production model of the Liberator to incorporate a nose turret installation in the factory, but these aircraft were assigned to other theaters of war.

The B-24J was in many ways a retrograde step in the bomber's development as the Liberator's already demanding handling qualities deteriorated even further due to drag caused by the nose turret installation. And with an overall increase in the aircraft's gross weight from 60,000lb (B-24D) to 65,000lb (B-24H/J), formation flying became all the more difficult, particularly when the bombers were routinely flown above their normal gross weights. The J-model was also slower than the B-24D, and it normally had to fly at a lower altitude.

It came as no surprise, therefore, that pilots preferred the D-model over the B-24J, even with the latter's superior armament. When the 7th BG converted to the J-model, the group's 492nd BS noted that "the old Ds gave wonderful service and were reluctantly parted with." To deal with the even more cramped conditions in the nose of the B-24J, the 492nd moved the navigator's station back to the top turret area.

Production of the B-24J began at Consolidated's San Diego plant on August 31, 1943, and the other factories in the production pool shifted to its construction over the following months. The B-24J was initially equipped with an A-6A turret in the nose, while later blocks employed the A-6B turret or the Emerson turret. The J-model retained the Martin dorsal turret and the A-6A/B turret in the tail, although the final blocks had some variation in the tail turret position. The bombardier and the navigator were required to be qualified on operation of the nose turret, but many squadrons added a dedicated nose gunner to the crew. Other minor changes included an improved C-1 autopilot and upgraded Pratt & Whitney R-1830-65 engines. During the course of the B-24J production run, enclosed and staggered waist windows were also introduced.



B-24L-1 44-41427 *COCKY BOBBY* reached the 425th BS in the autumn of 1944. The bomber would fly some 39 combat missions and complete more than 50 flights over the "Hump" during its time with the 308th BG. (Jim Augustus)

B-24L/M

The L- and M-model B-24, built in quantity for the USAAF, tried to address the twin problems of excessive weight and poor visibility. The B-24L was 1,000lb lighter than the B-24J, this reduction being accomplished by the removal of the Sperry ventral ball turret and the Consolidated A-6. In the B-24L, the manually operated M-6A "stinger" mount, with twin 0.50in. machine guns, replaced the A-6, although in some theaters a Consolidated tail turret was re-installed. The B-24M model went back to a powered tail turret, using a lightened version of the Consolidated A-6B, and reinstated the Sperry ball turret on many aircraft.

To improve vision out of the nose compartment, the B-24L employed large rectangular scanning windows just aft of the nose turret on both sides of the fuselage. The B-24M featured a redesigned flightdeck canopy to improve the pilot's vision for formation flying. M-models built by the Ford Motor Company retained the large scanning windows, but Consolidated's examples featured smaller windows. The vision problem the nose turret imposed was never truly solved on production models of the B-24.

NAKAJIMA Ki-43 "OSCAR"

Ki-43-I

The Ki-43-I, which was the initial production model of Nakajima's Hayabusa fighter then serving with the 50th Sentai in Burma, was the first version to encounter the Liberator in Asia. Exceptionally maneuverable, the Ki-43-I was not without its

The Ki-43-I was the first model of the "Oscar" to see combat, having entered service shortly before the outbreak of the Greater East Asia War. In the spring of 1942, the 50th Sentai returned to Japan from Burma to re-equip with the Ki-43. This photograph shows the sentai practicing formation flying over Tokorozawa airfield in June 1942. (Shunkichi Kikuchi)

problems, however, for it lacked structural strength, speed and armament. The 59th and 64th Sentais – the first units to re-equip with the Ki-43-I – both lost several pilots from structural failure of the wing. In a post-war interview, 64th Sentai Hayabusa ace Capt Yohei Hinoki described the Hayabusa as "a weak aircraft – attractive lines, but weak."

The Ki-43-I's 950hp Type 99 Nakajima Ha-25 14-cylinder radial engine gave the Hayabusa a top speed of 308mph, which was not much faster than the maximum speed of a B-24D. Yohei Hinoki found that operating the Ki-43-I at top speed created excessive vibration, which made aiming erratic. In respect to its weaponry, Hinoki thought the Hayabusa's "weak armament made it hard to destroy enemy aircraft." While standard references state that there were three versions of Ki-43-I, each with different armament – Ki-43-IA with two 7.7mm machine guns, Ki-43-IB with one 7.7mm and one 12.7mm weapon and the Ki-43-IC with two 12.7mm guns – more recent research indicates that the majority of K-43-Is were fitted with one 7.7mm machine gun with 500 rounds and one 12.7mm machine gun with 250 rounds. This was not much of an arsenal to put up against a B-24D. By way of comparison, the Luftwaffe found that it took 20 rounds of 20mm cannon fire to bring down a USAAF B-17 or B-24.

Ki-43-II

The successor to the Ki-43-I, the Ki-43-II incorporated a number of improvements that made it a more capable fighter, though still not what the circumstances of combat against the Allied air forces demanded. Nakajima installed a more powerful Type 1 Nakajima Ha-115 14-cylinder radial engine rated at 1,150hp driving a metal three-bladed propeller. This increased the Hayabusa's top speed to 329mph at 13,000ft. The wingspan was reduced by just under 2ft and the wing strengthened to address the structural issues.

Armament was increased to two 12.7mm Ho-103 machine guns with 250 rounds per gun, and a reflector gunsight replaced the earlier telescopic sight on the Ki-43-I. The Ho-103 machine gun could fire a high-explosive round which Allied aircrews often mistook for the more powerful 20mm cannon round. The Ki-43-II was fitted with armor protection for the pilot, with a ½in. armored plate located behind the pilot and a second ½in. plate of 11¾in. × 8in. behind the pilot's seat set at a 45-degree angle.

The JAAF's fighter sentais in Burma and China began converting to the Ki-43-II soon after it entered production. The 64th converted in December 1942, followed by the 50th in February 1943, the 25th Sentai in May and the 33rd shortly thereafter.

The Ki-43-II featured a stronger airframe, a more powerful Nakajima Ha-115 engine and improved armament of two 12.7mm Ho-103 machine guns mounted in the nose. The latter configuration remained standard in production versions of the Ki-43 through to war's end. (Peter M. Bowers Collection, Museum of Flight)

The pilots now had a fighter they could fly with confidence, but the demands then facing the Japanese fighter force were of a different nature. As Yohei Hinoki noted in his post-war interview, "by the time the Hayabusa had become a good attack aircraft things were changing. It was now to be used for defense, as an interceptor. So again its firepower was insufficient. And it lacked the speed needed for attacking bombers. The Hayabusa was coming to the end of its time."

Ki-43-II "OSCAR" GUNS

The Ki-43-II was fitted with two Ho-103 Type 1 12.7mm machine guns mounted in the forward fuselage and synchronized to fire through the propeller arc. The butts of the guns extended back into the cockpit on either side of the instrument panel, and the individual magazines for each weapon carried 250 rounds apiece. The Ho-103 was very similar in design to the Browning M-2 0.50in. machine gun. The main criticism of the Ho-103 was its slow rate of fire – around 400 rounds per minute when synchronized.

THE STRATEGIC SITUATION

In a space of only a few months the Japanese Army swept over Southeast Asia, ousting the colonial powers of America, Britain and the Netherlands. This photograph is from a contemporary postcard showing K-43-I fighters on an airfield somewhere in Southeast Asia during the first half of 1942. (Author's collection)

In early March 1942, Japan's Imperial General Headquarters met to decide on the strategy to be followed in the second phase of the Greater East Asia War. The first phase of Southern operations – to knock out American and British bases in the Philippines and Malaya and capture the Dutch East Indies – had been an outstanding success. Japanese forces were pushing forward in Burma to cut the Burma Road, which was China's last lifeline. Japan now had to consider how best to consolidate its territorial gains and prepare for the inevitable third phase of operations – the American and British counterattacks that were sure to follow.

The Japanese high command's overall objectives were to finally bring an end to the stalemated war in China, contribute to the surrender of Great Britain and to inflict such damaging casualties on American forces that they would lose their will to fight. To this end, the high command wanted to establish an impregnable defensive barrier that the Allies would not be able to penetrate.

Going forward, Japan would fight a protracted defensive war, employing all the resources of its newly conquered territories. The Japanese Army was confident that the American response in the Pacific area would not begin until 1943, and that the Allied preoccupation with defeating Germany would constrain the resources America could bring to bear against Japan.

The 308th BG was based at airfields around Kunming (terminus of the "Hump" route), in southwestern China. From here, B-24s could reach targets in central China, the China coast and French Indo-China. The opposing 25th and 33rd Sentais provided air defense over Japanese-occupied territory, moving between Hankow, Canton and Hanoi as the situation required.

To prepare for the inevitable counteroffensive in Asia, the Imperial General Headquarters activated the 3rd Kokugun Shireibu (3rd Air Army) in Singapore on July 4, 1942. Its job was to coordinate defensive air operations in Southeast Asia and offensive operations against India and China for the Southern Army and the China Expeditionary Army. The 3rd Kokugun took over control of the 3rd and 5th Hikoshidan, which were operating in the Dutch East Indies and Burma, respectively.

In August, in order to strengthen the air forces available in China, the Imperial General Headquarters ordered the 3rd Hikoshidan to return to China. It had been given the responsibility of supporting the operations of the Japanese Army, as well as maintaining air superiority over Japanese-occupied territory from Hankow south to Hanoi, in French Indo-China.

To provide the 3rd Hikoshidan with more fighter units, later that same month the 33rd Sentai was ordered to move from Manchuria to Canton. In November the 3rd Hikoshidan received its second fighter regiment when the 25th Sentai was formed

TOP LEFT
A group of 64th Sentai pilots admire a comrade's sartorial splendor. The 64th, which had been one of the first JAAF units to convert to the Ki-43, took over the defense of Rangoon and southern Burma in February 1943 after completing its conversion to the newer Ki-43-II. The 64th would fly the "Oscar" until the very end of the war. (Author's collection)

TOP RIGHT
7th BG crews gather for a briefing around a B-24D before taking off on a mission to bomb Rangoon in late 1942. The 7th started to re-equip with the D-model Liberator in October 1942. (File 827.306, Air Force Historical Research Agency (AFHRA))

out of the 10th Independent Chutai and assigned to Hankow. These two fighter regiments, both equipped with the Type 1 Fighter and moving from base to base within China, would be the principal opponents of the Fourteenth Air Force B-24s.

In Burma the 5th Hikoshidan also had two fighter regiments assigned – the 50th and 64th Sentais – with a combined total of 40 to 50 Type 1 Fighters. Like its counterpart in China, the 5th Hikoshidan was charged with maintaining air superiority over the battlefront and supporting the operations of the Japanese 15th Army in Burma. During 1943 much of the effort of the two fighter regiments was directed toward annihilating the RAF fighters and medium bombers supporting the British and Indian Army units fighting in the Arakan and attacking the US Tenth Air Force bases in Assam.

When the latter began regular daylight raids on Japanese targets in and around Rangoon, the 5th Hikoshidan, having no dedicated air defense unit, was forced to pull a fighter unit back from the front for the defense of Rangoon. From November 1942 to February 1943 the 50th Sentai was based at Toungoo, north of Rangoon, to cover the city while the 64th Sentai returned to Japan to re-equip with the Ki-43-II. The 50th Sentai alternated its air defense duties with missions over the Arakan front. The 64th Sentai returned to Burma in February 1943 to take over the defense of Rangoon, flying out of Mingaladon airfield (near Rangoon) and Toungoo until the onset of the monsoon in June.

Like the 50th Sentai, which re-equipped with the Ki-43-II in March and shifted to the Japanese airfield at Meiktila in central Burma, the 64th Sentai continued to fly missions over the Arakan in support of the Japanese Army's operations, moving back and forth between the airfields around Rangoon and forward bases closer to the Arakan. It appears that in the months before the monsoon the 64th Sentai maintained one chutai in the Rangoon area while its remaining two chutais flew missions in the Arakan. During March 1943 the 21st Sentai arrived at Mingaladon with a number of Kawasaki Type 2 Two-Seat Fighters (Ki-45) as reinforcement for the air defense of Rangoon.

For the United States, a key objective in 1942 was to ensure that China remained an active participant in the war. The Japanese Army had more than a million men in China and Manchuria, and American war planners wanted to ensure that Japan's

commitments there would continue to contain these troops, thus acting as a drain on its limited resources. In addition, in the early months of 1942 it seemed that China would be the most logical base for air raids against the Japanese home islands, which were a pre-requisite for the ultimate invasion of Japan.

After four years of war, however, the Chinese were short on military equipment and resources of all kinds, with a poorly trained and poorly equipped army and air force. With the loss of Burma and the Burma Road, the only means of supplying China with vital defense supplies was the air route between Assam in northeastern India and Kunming in China – what would become the famous "Hump" route. In early 1942 the United States created the China–Burma–India Theater of Operations to oversee support for China, the USAAF simultaneously activating the Tenth Air Force to control air operations in the CBI and to provide for the defense of the air route to China.

The USAAF allocated one heavy bomber group to the Tenth Air Force. With the fall of the Dutch East Indies in March 1942, the 7th BG was transferred from Australia to India, but it would be some months before the group could muster more than a few aircraft due to the urgent requirements in the Middle East and England. In October 1942 the 7th BG began receiving new B-24D Liberators, and these were used to launch a bombing campaign against Japanese forces in Burma from bases east of Calcutta, in India, the group operating as part of the India Air Task Force.

In March 1943, at the urging of Brig Gen Claire Chennault, President Roosevelt and the Joint Chiefs of Staff agreed to support a more aggressive air campaign in China, splitting off Chennault's China Air Task Force from the Tenth Air Force to

A 7th BG B-24D flies over the Burmese town of Toungoo in April 1943. The 64th Sentai maintained a detachment of Ki-43 "Oscars" here during the first half of 1943. (AFHRA File 827.306)

During 1942–43 the 7th BG was based at three airfields east of Calcutta. To reach Rangoon the group would fly down the Bay of Bengal, making landfall over the Irrawaddy River delta southwest of Rangoon, and then turn inland towards the city. The 50th and 64th Sentais flew from Mingaladon and Toungoo in their defense of Rangoon and southern Burma. The 50th and the 64th also used Meiktila as a forward base for operations over the Arakan between Akyab and Cox's Bazar.

The 436th BS/7th BG pulls away from bombing the railway marshaling yards at Rangoon on December 20, 1942. The Irrawaddy River can be seen flowing south into the Gulf of Martaban. The B-24s would approach Rangoon from over the gulf, bomb the target and then fly back out over the gulf, where the Japanese fighters were reluctant to follow. (via Col Thomas Sledge, USAF Retired)

create the new Fourteenth Air Force, based in China. Chennault was allocated the 308th BG, equipped with B-24s, to carry out long-range bombing missions from airfields around Kunming in China. The 7th and the 308th BGs remained the only heavy bomber groups assigned to the CBI Theater.

USAAF strategic bombing doctrine stated that the objective of a bombing campaign was the destruction of the enemy's means of prosecuting a war. In the CBI Theater there were few worthwhile industrial targets, as Japan's war industries were situated in the home islands, out of range of the B-24s. Instead, the Tenth and Fourteenth Air Forces concentrated their bombing effort on counter-air operations, attacking airfields, base installations and, most importantly, the transportation systems supporting Japan's lines of communication.

While Japanese armies were instructed to use local resources wherever possible to reduce the demands on the home islands, almost all arms and equipment had to be shipped from Japan and then transported overland to the frontlines. In Burma, disruption of the Japanese lines of communication meant a series of attacks on shipping and port facilities in the south of the country and attacks on the railway infrastructure bringing supplies to troops in the field. In China the Fourteenth Air Force had the 308th BG attack JAAF installations and port facilities, before switching to direct attacks on shipping in the South China Sea.

What most Japanese fighter pilots expected to happen when they encountered the B-24! This heavily retouched wartime news photograph purported to show a JAAF fighter shooting down an American Liberator bomber. (Author's collection)

For much of 1943 the 7th and 308th BGs operated with a number of constraints. The CBI Theater had a low priority for men and equipment. The 7th BG was chronically short of combat crews, which limited the number of aircraft that could be sent out on missions, while the 308th BG had to devote a considerable amount of effort to flying supplies for its own needs over the "Hump" so as not to act as a drain on the flow of supplies to the rest of the Fourteenth Air Force. Not until the autumn of 1943 were the two bomb groups able to carry out missions of any considerable size.

In May 1943 the 308th BG, assigned to the Fourteenth Air Force in China, flew its first combat mission to bomb the airfield and harbor at Samah, on Hainan Island. (Courtesy John V. Osborne via the National Museum of the US Air Force)

THE COMBATANTS

USAAF COMBAT CREW TRAINING

When President Franklin Roosevelt called for the rapid expansion of America's air force and gave his support to the acquisition of four-engined bombers for strategic bombardment, he presented the USAAC with a formidable training challenge. The new B-17s and B-24s required crews that were not simply two-thirds bigger than the USAAC's then standard twin-engined Douglas B-18 Bolo bomber, but were also capable of operating a more complicated aircraft. This meant the training of individuals to perform, in close cooperation, the complex task of executing a bombing mission.

As the planned number of heavy bomber groups for the USAAC grew, this in turn generated an accelerating demand for crews – pilots, bombardiers, navigators, radio operators, flight engineers and gunners – to man them. Providing intensive training to individuals in each of these specialties was not enough. They had to be molded into fully functioning combat crews, and combat crews into fully functioning combat units. The essence of a successful combat crew and a successful bomb group was teamwork, and teamwork at all levels had to be built up through intensive operational training.

In the small pre-war USAAC, as in many other air forces, much of the specialized training, and all the operational training, was conducted at unit level. Prior to 1940 the USAAC had few specialist navigators and no specialist bombardiers. Pilots received some basic navigation skills during their flight training, while a pre-war bomber group's bombardiers were typically those pilots and enlisted men who had completed the requirements for qualification as a bombardier according to the TR-440-40 *Aerial Gunnery and Bombing* manual. Gunnery training followed a similar model.

Student pilots head out to their Beech AT-10 twin-engined trainers at the USAAF's Pilot School (Advanced 2-Engine) at Ellington Field, Texas, in 1942. After completing Advanced 2-Engine School, prospective bomber pilots would move on to transition training in heavy bombers and then to operational training, where they would become part of a full crew. (via the author)

With a slower pace and fewer numbers, new pilots, once they had joined their operational unit fresh from flying training, and enlisted aircrew were given training in flying operational aircraft. They gradually became proficient through participation in squadron and group exercises.

With the approach of war, demanding expansion plans and the introduction of newer and more complicated aircraft, it quickly became evident that no one individual could perform all the functions required in a modern bomber. To maximize performance, pilots would have to concentrate on flying, bombardiers on bombing, navigators on navigating and so on. As Gen "Hap" Arnold, Commanding General of the USAAF, said in his Third Report to the Secretary of War, "this is an age of specialization. No rational man can hope to know everything about his profession."

The proposed size of the USAAC and its successor, the USAAF, expanded rapidly from a planned 25 combat groups in November 1940 to a planned 273 groups in August 1942. Ultimately, the USAAF activated 80 bombardment groups. To cope with the demands for combat crews to man these groups, during 1940–41 training programs were set up to train specialist bombardiers, navigators, radio operators, flight engineers and aerial gunners. The pre-war system of providing special training in combat units was simply no longer tenable. Once fully functioning, and not without many challenges along the way, these training programs provided a steady stream of specialists who would make up the combat crews the B-17s and B-24s required.

Navigator and bombardier training provide good examples of the training process (for an overview of pilot and gunnery training see Osprey's *Warrior 119 – American Bomber Crewman 1941–45* and *Duel 24 – Fw 190* Sturmböcke *vs B-17 Flying Fortress*). Throughout 1942 navigator cadets undertook a 15-week training program involving 403 hours of ground training and 100 hours of training in the air. This program was extended to 18 weeks in January 1943. Even though this was considered inadequate training in navigation, in the first years of the war the nearly insatiable demand for navigators for a now worldwide USAAF acted as a restraint on

B-24D LIBERATOR NOSE COMPARTMENT

1. Map case
2. Oxygen regulator
3. Left ammunition box
4. Clock
5. Airspeed indicator
6. Outside air temperature indicator
7. Altimeter
8. Left Browning M-2 0.50in. machine gun
9. Flexible ammunition feed belt
10. Bomb selector and control panel
11. Bomb control quadrant
12. Center gun firing switch
13. Invalometer
14. Norden bombsight
15. Bombardier's seat
16. Center Browning M-2 0.50in. machine gun
17. Right Browning M-2 0.50in. machine gun
18. Flexible ammunition feed belt
19. Defroster hose
20. Cabin heater
21. Right ammunition box
22. Receptacle for flying suit heating plug
23. Portable oxygen bottle
24. Compass
25. Light
26. Bombardier's intercom control
27. Alarm bell

Student bombardiers prepare to board a Douglas B-18A at a bombardier school in Texas. Until sufficient numbers of Beech AT-11 aircraft, seen here beyond the B-18, became available, many bombardiers trained on the veteran Douglas "bombing twin". (via Dan Hagedorn)

lengthening the course further. Navigation training covered dead reckoning, pilotage (navigation using compass headings in combination with terrain features indicated on a map), celestial navigation and radio navigation.

In the early months of the war there were shortages of nearly everything needed to produce trained navigators – bases, instructors and aircraft. With first-line operational aircraft all going to combat units, cadets flew in a mix of older operational bomber types such as the Douglas B-18 and Lockheed AT-18 and B-34 that had been modified into navigation trainers, and specially designed navigation trainers such as the Beech AT-7.

Bombardiers went through a shorter training course that was quickly cut to nine weeks in February 1942 to increase the number of them coming out of training. Roughly three-quarters of the training program consisted of ground classes in bombing theory, bombsights and bombing procedures. Bombardier cadets practiced on the A-2 bombing simulator – a 10ft-tall moving platform that allowed the cadet to practice using the bombsight. During the first part of the war cadets received training on the Norden M series bombsights or the Sperry S-1 sight.

Training in the air was divided into the qualification stage, where the bombardier cadet practiced operating the bombsight with practice bombs, qualifying by dropping a certain number of bombs within a certain radius of a target, and the tactical stage, where cadets were given more complicated operational problems. Typically, a cadet would drop 120 to 145 practice bombs during the qualification stage and 55 to 80 bombs in the tactical stage.

At some point during their training both navigators and bombardiers were supposed to receive several weeks of flexible gunnery. This was important, for in many units equipped with the B-24D the bombardier was responsible for operating the 0.50in. machine guns in the nose compartment. During much of 1942, however, the gunnery schools were too full of gunnery students to accommodate all the navigators and bombardiers that needed training. In addition, the requirements of combat units

As a young newly minted bombardier, Lt Thomas Sledge trained on B-17s, only to be shifted to a B-24 crew shortly before departing overseas to join the 7th BG. Sledge's experience was not untypical of the hectic first year of the war, when the demand for combat crews outweighed the normal pattern of training. (via Col Thomas Sledge, USAF Retired)

in the field and in the process of formation meant that gunnery training was often skipped entirely in favor of getting trained bombardiers and navigators into combat crews. In some cases a certain amount of gunnery training was provided during operational training, but often this was minimal.

Thomas Sledge recalled that the sum total of his gunnery training prior to going into combat consisted of 30 minutes operating a 0.30in. machine gun in the nose of a B-17E. When he was hurriedly assigned to a B-24 crew heading out to India that needed a bombardier, he had never even seen a 0.50in. machine gun, much less fired one!

After graduating from a specialized training program, the newly minted pilot, bombardier, navigator or other aircrew would be assigned to a new duty station to begin operational training. Unlike in the RAF, where bomber crews essentially selected each other, in the USAAF combat crews were assembled through a random process which was, in the words of the *The Army Air Forces in World War II*, "almost entirely a matter of checking names from alphabetical rosters." Remarkably, in the majority of cases these nine or ten individuals thrown together from every corner of America, as celebrated in Hollywood movies of the time, managed to get along and were confident that they were "the best damn crew in the entire Army Air Force."

The pre-war system of operational training at squadron and group level was completely revamped to meet the exigencies of war. During the first few years of USAAC/USAAF expansion existing squadrons and groups were continually denuded of experienced personnel who were sent to form completely new units. The "parent" unit then had to be brought back up to strength through an influx of newly trained and inexperienced personnel. This in turn meant that the new groups lacked sufficient experienced staff to conduct more advanced operational training. Borrowing from RAF experience, the USAAF set up a system of Operational Training Units to provide advanced training and to bring new units into being.

This system used a designated "parent" unit, which was utilized for training purposes and not intended for overseas service, to train and then spin off a "satellite" unit incorporating a mix of experienced and newly-trained personnel. The "satellite" unit would be the basis for a new combat group that would ultimately be sent overseas after three to six months' training. Later in the war, once most of the required combat groups had been established, the training system shifted to Replacement Training Units to train individual combat crews, not complete units, for overseas duty.

Among the air forces remaining in the continental United States, the Second Air Force became the primary source for heavy bombardment units and replacement crews. In total, 14,708 B-24 combat crews received training.

Heavy bombardment training was divided into three phases. In the first phase, crewmen would receive more intensive training in their individual specialties, ideally in the aircraft they were to take into combat, as well as thorough ground instruction. For the pilots, this meant converting to a combat aircraft with intensive flying and more emphasis on instrument and night flying, while navigators flew longer cross-country flights and bombardiers more complicated bombing runs. In the second phase, the emphasis shifted to working as a crew to build effective teamwork, with simulated combat missions performed by the complete crew. The third phase focused on the operation of a full unit, with extensive training in high-altitude flying, formation flying with larger squadron or group formations and more complex simulated combat missions.

Lt Higdon's crew during operational training on B-24s. They went on to serve with the 9th BS in the 7th BG. (7th BG(H) Historical Foundation, USAFA McDermott Library)

All three phases of training were conducted against specific standards that needed to be met before a crew or a unit could be considered combat ready. The goal of all phases of training was, in the words of an Air Force Historical Study on Combat Training, "to create a closely knit, well organized team of highly trained specialists."

JAAF OPERATIONAL TRAINING

Up until 1941 the JAAF conducted most of its operational training at unit level. Towards the end of their intermediate training, pilot trainees would be assigned to bomber, fighter or reconnaissance aircraft. Only then would they begin conversion to the type of aircraft they would fly in combat. Pilots would then proceed to an advanced flying training school for more specialized tuition in their selected branch. The JAAF maintained advanced flying training schools for bomber, fighter and reconnaissance pilots, where trainees would complete a three- to four-month course.

During the 1930s the Army Aviation School at Akeno in Japan became the center for training fighter pilots. Here, a prospective fighter pilot would gain more experience handling frontline fighter aircraft, after which he would be introduced to the rudiments of air combat tactics, including formation flying and air-to-air gunnery. On completion of advanced flying training, the pilot would be posted to an operational unit, where he would complete his operational training under the supervision of more experienced pilots and be integrated into the unit.

CONRAD F. NECRASON

Conrad "Nick" Necrason was one of the pre-war USAAC pilots who formed the backbone of the rapidly expanded USAAF in World War II, and one of a number of pre-war pursuit pilots who were transferred to bombers on the eve of war.

Necrason was born in Cooperstown, New York, in 1911. He entered Lafayette College, but in 1932 received an appointment to the US Military Academy at West Point. On graduation he was commissioned a second lieutenant and entered flying training at Randolph Field, Texas, graduating from Kelly Field, San Antonio, in 1937. Necrason was assigned to the 3rd Pursuit Squadron in the Philippines, where he flew P-12 and P-26 pursuits. He returned to the USA in 1940, joining the 35th Pursuit Group, but in mid-1941 he was transferred to the 7th BG, then at Salt Lake City, Utah, where he converted to the B-17. Shortly after joining the 7th Necrason was promoted to major.

When Pearl Harbor was attacked the 7th BG was in the process of transferring to the Philippines, but the invasion of the latter country by Japanese forces resulted in the group being diverted to Java. Maj Necrason flew a B-17E from the USA to Java via the African route, and he fought in the Dutch East Indies until the remnants of the 7th BG were withdrawn in early March 1942. For heroism in action over Java, Necrason was awarded the Distinguished Flying Cross. Transferred to India, he was promoted to the rank of lieutenant colonel and given command of the 7th BG in July 1942. Necrason subsequently led the group until February 1944, being promoted to full colonel in 1943. He was a respected and well-liked commander who always chose to lead the tough missions.

Necrason led the first B-24 mission to Bangkok, Thailand, in November 1942 – a 2,760-mile round trip from India. On March 31, 1943, while leading the second element from the 493rd BS against a railway bridge in central Burma, a Japanese fighter made a head-on attack on Necrason's B-24D, wounding him and his co-pilot. Despite his injuries Necrason flew his bomber back to base. He was duly awarded the Silver Star for his actions.

As a commander Necrason insisted on air discipline. For nearly a year the 7th BG flew missions deep into Burma without fighter escort. His cardinal rule for defense against enemy fighters was "to maintain the integrity of the formation." In a report written at the conclusion of his combat tour, Necrason stated that "time and again, formations have met heavy fighter opposition and have come out intact only because the integrity of the formation was maintained and a thorough knowledge of air discipline was displayed by each combat crew."

Necrason remained in the USAF after the war, commanding several B-29 bomb wings and participating in the Korean War. He later led Alaskan Air Command and was promoted to major general in 1958. Necrason retired from the USAF in 1965 and died in 1997.

NAKAKAZU OZAKI

Although JAAF records are incomplete, Nakakazu Ozaki was in all likelihood the most successful Hayabusa pilot flying against the B-24 Liberator in the CBI Theater. Like Conrad Necrason, Ozaki is representative of the young pre-war Japanese Army aviators who took on leadership positions in the midst of war and duly became highly successful fighter pilots.

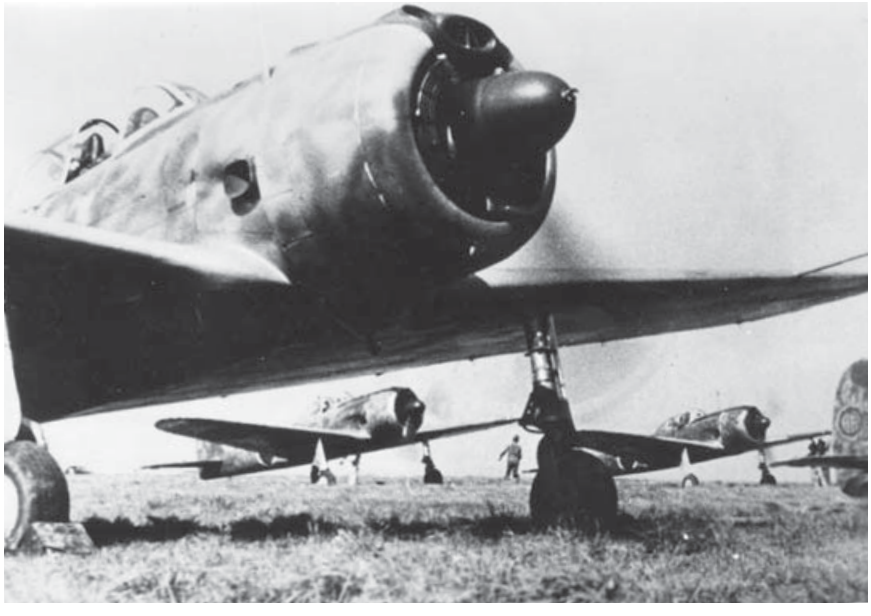
The descendent of a Samurai family and the son of an Imperial Japanese Navy officer, Ozaki was born at the naval base at Sasebo in 1919. After completing middle school he joined the Tokyo Junior Military Academy – one of the routes to becoming an officer in the JAAF. From there he went to the Army Military Flying Academy, where he received flying training until he graduated in June 1940. Ozaki was then posted to the 33rd Sentai in Manchuria, where he flew the Nakajima Type 97 Fighter but saw no air combat. While with the 33rd he developed his skills as a marksman, regularly achieving the highest scores in gunnery practice. This skill would serve him well in combat.

In 1941 Ozaki returned to the army advanced flying school at Akeno, south of Nagoya, which taught formation flying, air tactics and air fighting using operational aircraft. He served as an instructor at Akeno until October 1942, when he was sent on a commander's course. On completion of the course Ozaki was posted to the 25th Sentai in China, where he took command of the 2nd Chutai, operating between Hankow, Canton and Hanoi, in French Indo-China.

By then a 24-year old lieutenant, in appearance Ozaki seemed an unlikely candidate to become a successful fighter ace. His fellow pilots sometimes alluded to him as the "young lady" because of his gentle demeanor, but in combat he showed no lack of courage and quickly proved himself to be an excellent marksman. Indeed, Ozaki soon became known as "the B-24 killer" for his exceptional success against the 308th BG's B-24s.

Ozaki learned what the Hayabusa pilots in the 50th and 64th Sentais had discovered fighting Liberators over Burma – to shoot down a B-24, a Ki-43 pilot had to hurl himself at the enemy, heedless of the risk, and press home the attack as close as possible. Ozaki excelled in close-in attacks from the front and the side. It was said that he would fly so close to the enemy bombers that he could hear the sound of their machine gun fire. Ozaki was given credit for the destruction of six B-24s, and he damaged 12 to 14 additional bombers. His achievement was recognized with the reward of an individual citation – not a common practice in the Japanese Army. The citation read, in part, "In attacks against large enemy aircraft his skill was perfect. Given the chance to attack, he charges at the enemy formation despite heavy return fire, attacking from close range."

Ozaki's last success against a B-24 came on December 24, 1943 when he claimed a bomber from a 308th BG formation that was targeting Tien Ho airfield near Canton. Three days later Ozaki, recently promoted to captain, was killed when he deliberately rammed a P-51A over Suichuan. At the time of his death he had been credited with 19 victories.



Japanese fighter pilots learned to fly the Hayabusa during their advanced flying training. These Ki-43-IIs belong to the Akeno Army Flying School, where pilots trained on all frontline JAAF fighter types and learned the rudiments of air combat. (Peter M. Bowers Collection, Museum of Flight)

Unit-level training included, in the pre-war period, formation, cross-country and night flying, aerobatics, more air-to-air and air-to-ground firing and extensive training in air-to-air combat, including exercises with a gun camera. The air combat training would build up from one-on-one engagements, pitting one aircraft against another, to air combat between flights and then between squadrons.

Ideally, operational training at unit level would last six months, after which the pilot would be deemed qualified and ready to undertake operational flying, having accumulated 500 to 600 hours of flying time.

At the end of 1941 the JAAF initiated a rapid expansion of its pilot training to cope with the wartime demand for more pilots. To relieve the training burden on operational units, specialized advanced training squadrons were set up overseas in Korea, China and in Southeast Asia. These Rensei Hikotai were intended to provide more intensive operational training during a four-month course, although as the war progressed their effectiveness declined and they were often called upon to participate directly in operations.

While the new training organization succeeded in ramping up the flow of pilot trainees – dramatically so during 1944 – this came at the cost of a sharp reduction in flying hours. At the beginning of the war JAAF pilots had an average of around 500 flying hours on completion of their training. By the end of 1944 this had been reduced to less than 200 hours.

Up until the end of 1943 the Ki-43 sentais in Burma and China could still afford to withdraw some of their squadrons during the monsoon season to quieter rear areas, where they could resume unit training and absorb new replacement pilots.

A document captured at one of the airfields in New Guinea later in the war revealed that the JAAF had specified a detailed training schedule for its fighter sentais. The regimen was divided into routine training, which covered formation flying in combat,

landings and takeoffs, assembly in increasingly large formations and combat training, which focused on tactics.

The first stage of combat training involved the buntai, consisting of two aircraft (the JAAF began switching to a two-pair, four-aircraft formation during 1943). The two aircraft would practice ground attacks, engaging bombers from multiple directions, attacks and evasive maneuvers against fighters, where two buntai would be pitted against each other, and gunnery practice. These training elements would then be expanded to include larger and larger formations, starting with the shotai (four aircraft), then moving to the chutai (12 aircraft) and, finally, a full sentai (36 aircraft).

The training program gradually built up, level by level, to more complicated tactics emphasizing coordinated attacks on enemy bomber or fighter formations. One shotai or chutai would act as the enemy force for the other, and at the last stage of training at the sentai level, one chutai would act as the enemy force for the other two, mimicking either a formation of enemy bombers or fighters. The fighter sentais were instructed to carry out some of this air combat training during regular standing patrols or fighter sweeps.

This training program no doubt represented an ideal. As the fighter sentais ran out of pilots, aircraft and fuel, and as the press of operations made it less possible to withdraw from combat for any extended period of time, it is doubtful that they could conduct much in the way of formal operational training.

A contemporary news photograph showing Japanese fighter pilots receiving training in air combat maneuvers from their instructor while a Ki-43 flies past overhead. In the early years of the war a great deal of operational training took place at unit level. Some successful pilots who managed to survive combat were returned to Japan to serve as instructors. (Author's collection)

Ki-43-II "OSCAR" COCKPIT

1. Gunsight
2. Airspeed indicator
3. Turn and bank indicator
4. Rate of climb indicator
5. Manifold pressure gauge
6. Compass
7. Altimeter
8. Tachometer
9. Fuel pressure gauge
10. Oil pressure gauge
11. Oil temperature gauge
12. U/C warning lights
13. 12.7mm gun
14. Guarded switch cover
15. Engine primer fuel pump
16. Cocking handle
17. Cabin lamp
18. Elevator trimming
19. Chronometer
20. Radio tuner
21. Radio dial
22. Cylinder temperature
23. Exhaust temperature
24. Control column
25. Canopy winding mechanism
26. Combat flap control buttons
27. Main switches
28. Oxygen control
29. Oxygen flow meter
30. Fuel gauge (main tanks)
31. Fuel gauge (auxiliary tanks)
32. Right and left auxiliary tank selector
33. Right and left main tank selector
34. Pilot's seat
35. Hydrostatic plunger for main tanks
36. Hydrostatic plunger for auxiliary tanks
37. Hydraulic brake pedals
38. Rudder pedals
39. P.4 compass
40. Emergency hydraulics hand pump
41. Magneto switch
42. Throttle lever
43. Mixture control
44. Propeller pitch control
45. Friction adjuster
46. Control handle valve (use unknown)
47. Internal tanks cock
48. Main fuel cock
49. Undercarriage emergency operation
50. Cam manipulation
51. Undercarriage selector
52. Flap selector
53. Compressed air bottle

COMBAT

USAAF B-24D TACTICS

In 1942 USAAF strategic bombing doctrine called for unescorted daylight precision bombing missions. When encountering enemy fighter aircraft, bombardment units were to rely on disciplined formation flying and massed defensive fire. Under Col Necrason the 7th BG maintained good air discipline, but it would be some time before the group could deploy a massed formation of bombers. The 7th BG began flying combat missions with its new B-24D Liberators in November 1942.

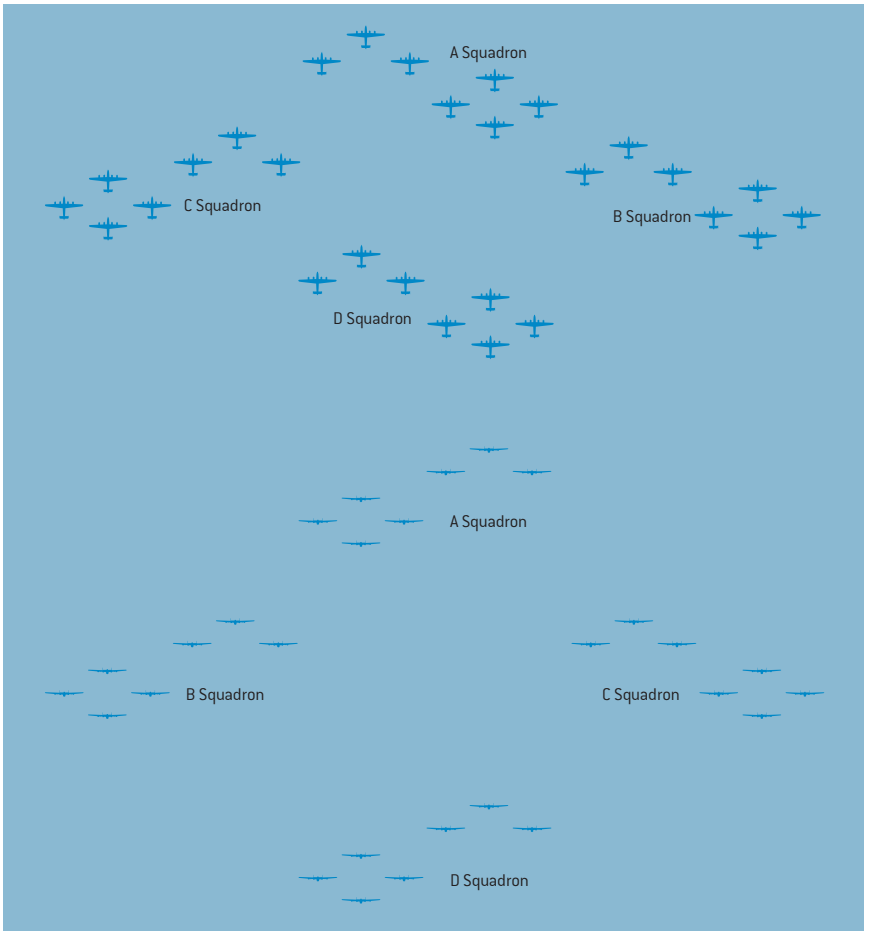
Through most of 1943 the group was chronically short of combat crews. The 7th's component squadrons (the 9th, 436th, 492nd and 493rd) were rarely at full strength. Indeed, between November 1942 and September 1943 the group managed to send out more than a dozen aircraft on only ten percent of its missions.

Most operations carried out during this period involved a single squadron with six to nine aircraft. The standard squadron formation consisted of seven aircraft. Nine Liberators were used for important targets, and a nine-bomber mission was considered a "big deal" in 1943. Fortunately, Japanese fighter opposition over Rangoon during this period was limited.

The 7th BG adopted the Squadron Javelin Formation as the standard combat formation for single squadrons. Units flew in a stepped-down Javelin Formation, called Javelin Down, with the second flight of three bombers stepped down behind the lead flight and the single bomber stepped down behind the second flight. The USAAC's bombardment squadrons had developed the Squadron Javelin Formation during the 1920s and 1930s. The USAAC Field Manual FM 1-10 *Tactics and Technique of Air Attack* stated that the Squadron Javelin Formation

On the run in to the target, the squadron would close up into a tight Javelin Down Formation. This is a still photograph taken from a remarkable ciné film made during an actual combat mission the 7th BG flew in the autumn of 1943. (via Col Thomas Sledge, USAF Retired)

The 7th BG used this formation for missions employing all four of the group's squadrons. The latter flew in right and left echelon off the lead (A) squadron, with the fourth (D) squadron flying in the rear. This formation had the benefit of allowing the squadrons to shift to tighter Javelin Down Formation on the approach to the target so as to achieve better bombing accuracy and an improved defense against JAAF fighters.

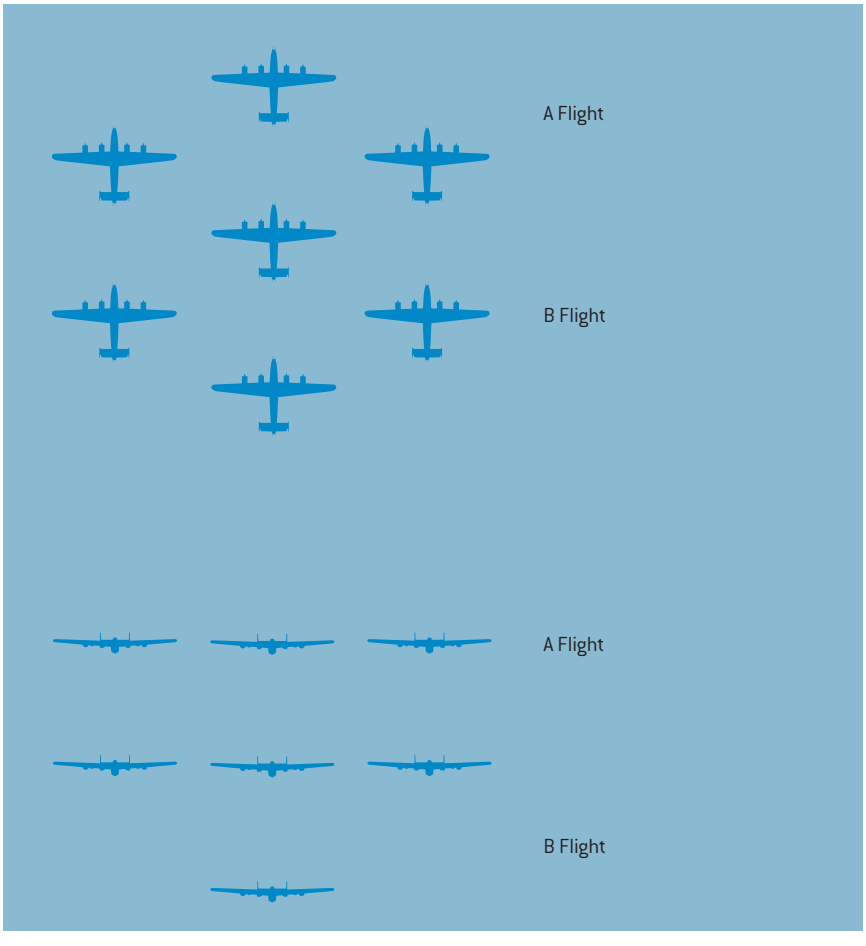


In a still photograph taken from the same ciné film, the bombardier sets up his Norden bombsight for the bomb run. Note how the crew has mounted a 0.50in. machine gun above the bombsight instead of its normal position below. (via Col Thomas Sledge, USAF Retired)

"affords one of the heaviest concentrations of defensive fire possible to present with the number of aeroplanes involved. While this formation offers a maximum degree of compactness, it is also very maneuverable and easily controlled." The Javelin Down Formation proved ideal for a single squadron coping with fighter attacks and later flying through bad weather. The Javelin Down Formation had the additional benefit of facilitating precision bombing by grouping the aircraft in a reasonably tight formation on the bombing run.

The 7th BG's targets in southern Burma were 750+ miles from the group's bases in India – well beyond the range of the RAF Hurricanes and USAAF P-40s that were the only fighters in-theater for most of 1943. The group had no alternative but to fly unescorted missions deep into Japanese-occupied territory. Air discipline, defensive fire and, as the 7th BG was to learn, evasive tactics were the only means of countering Japanese fighter attacks. Of the three, the combination of air discipline and evasive tactics would prove the most effective.

The 7th BG soon found that a small formation of six or seven B-24s, flown by well-trained and experienced crews, was actually highly



LEFT
The 7th and 308th BGs both frequently employed the Javelin Down Formation as an individual squadron formation. Developed during the interwar period, this formation proved to be effective in combat against small numbers of Ki-43 fighters. When flown with strict discipline, the Javelin Down Formation allowed a small formation of B-24s to execute a range of evasive maneuvers. The 7th BG found that turning into attacking fighters as they were making a frontal approach could disrupt their attack and force them to begin all over again.

BELOW
7th BG B-24Ds sit side by side at Pandaveswar, in India, between missions. For much of 1943 the 7th BG experienced a shortage of combat crews, limiting the number of aircraft that could be sent on a mission. (3A-33643, RG 342FH, NARA)

maneuverable. With good air discipline, a small formation could undertake sharp evasive maneuvers and still maintain all-important formation integrity. The Japanese fighter pilots in Burma also learned through their own experience to concentrate their attacks from the front. Indeed, the majority of attacks on 7th BG B-24 formations came from the "one" to "two o'clock" and the "ten" to "eleven o'clock" positions, and usually at the same altitude or slightly above.

After the first few encounters with "Oscars," the B-24 squadrons found that if they turned into the Japanese fighters they could disrupt their attack. A diving turn, in particular, would give the top turret gunners an opportunity to fire at the attacking fighters, and it would also more rapidly close the gap between the fighter and the bomber, giving the Ki-43 less time to take aim and fire. The best evasive maneuver was to carefully time the diving turn so that the B-24 formation began to lose height just before the Japanese fighter commenced its attack. Often this would force the JAAF pilot to dive away past the bomber formation to set up a new attack.

The other effective evasive maneuver for a small formation was to turn away from the attacking fighter approaching for a frontal attack, leaving the Ki-43 pilot with little choice but to attack from the rear quarter in the face of the B-24's tail turret, which most were reluctant to do. In this situation the JAAF pilot would again have to pull away, catch up with the bomber formation and start his attack all over again. With the B-24D, the 7th BG found that formations could bomb from altitudes up to 25,000ft. At these altitudes, with the B-24s using maximum cruise power to leave the target area at high speed, the speed advantage the "Oscar" had over the Liberator was reduced. The 7th BG soon discovered that with these evasive tactics and a high-speed withdrawal, the attacking Ki-43s could make only three or four passes during a 40- to 60-minute battle.

A 7th BG briefing for a mission deep into Burma. In order to return to their bases in India before dark, missions to Rangoon usually took off early in the morning, calling for an even earlier briefing. (3A-36248, RG 342FH, NARA)

On an ordinary mission to Rangoon, one or sometimes more squadrons would take off from their bases after dawn. The 7th BG faced one tactical disadvantage in flying daylight missions into Burma. The flights to targets in the south of the country were typically eight to nine hours long. In order to return to base before dark, the bombers had to take off at dawn, which meant they would be over their targets around noon. The Japanese soon learned that the American bombers had a narrow window of one to two hours either side of noon during which to make their attacks, simplifying the task of maintaining fighters on alert.

On the way to the target out over the Bay of Bengal the B-24s flew in a loose formation, as there was little risk of interception. (3A-33602, RG 342FH, NARA)

The bombers would fly in loose formation down the Bay of Bengal, paralleling the Burma coast, staying far enough out to sea to avoid visual detection. A slow climb would bring the formation up to the bombing altitude of 22,000–23,000ft. As the formation turned in at the Burma coast and headed toward Rangoon, the bombers would close up into Javelin Down Formation as they neared the designated initial point. After bombs away the formation would turn back toward the coast, exiting at maximum cruising speed at altitude or sometimes in a gentle dive to build up speed.

Once the group had experienced a number of fighter attacks, it designated a single individual in each aircraft to control the bomber's defensive fire. As the bombardier had responsibility for manning the 0.50in. nose machine guns, it was usually the navigator who was chosen to fulfill this important role. Working in conjunction with the tail gunner, who could monitor aircraft passing the bomber formation for a frontal attack, the navigator would stand in the astrodome and call out incoming fighters, giving an estimate of their range for the gunners.

Although blurry, this still photograph taken from the ciné film of a 7th BG combat mission shows a silver Ki-43 "Oscar" diving through a formation of B-24s over Burma. (via Col Thomas Sledge, USAF Retired)

In a report on B-24 tactics over Burma, Col Conrad Necrason, commander of the 7th BG during 1943, stated his belief that good evasive tactics were a far more effective means of defense than the massed fire of heavy bombers that USAAF doctrine called for. Necrason said:

> The only thing lethal about a fighter is its nose. If you plan your maneuvers so that you reduce to a minimum the length of time that the nose of the fighter is pointed toward your formation, evasive tactics are a success. It is a great mistake to fly straight and level in order to maintain a steady shooting platform for bombardment gunners. The gunners just aren't that good!

In China the 308th BG adopted similar tactics, frequently using the Javelin Down Formation, but also flying variations of a V-shaped

The right waist gunner fires at an "Oscar" as it races past his bomber. Capt Yasuhiko Kuroe recalled the unique sound and sensation of bullets hitting his Ki-43 as he flew past a formation of B-24s, noting that it was "as if a part of the body that didn't have nerves got shot and you could feel it." (via Col Thomas Sledge, USAF Retired)

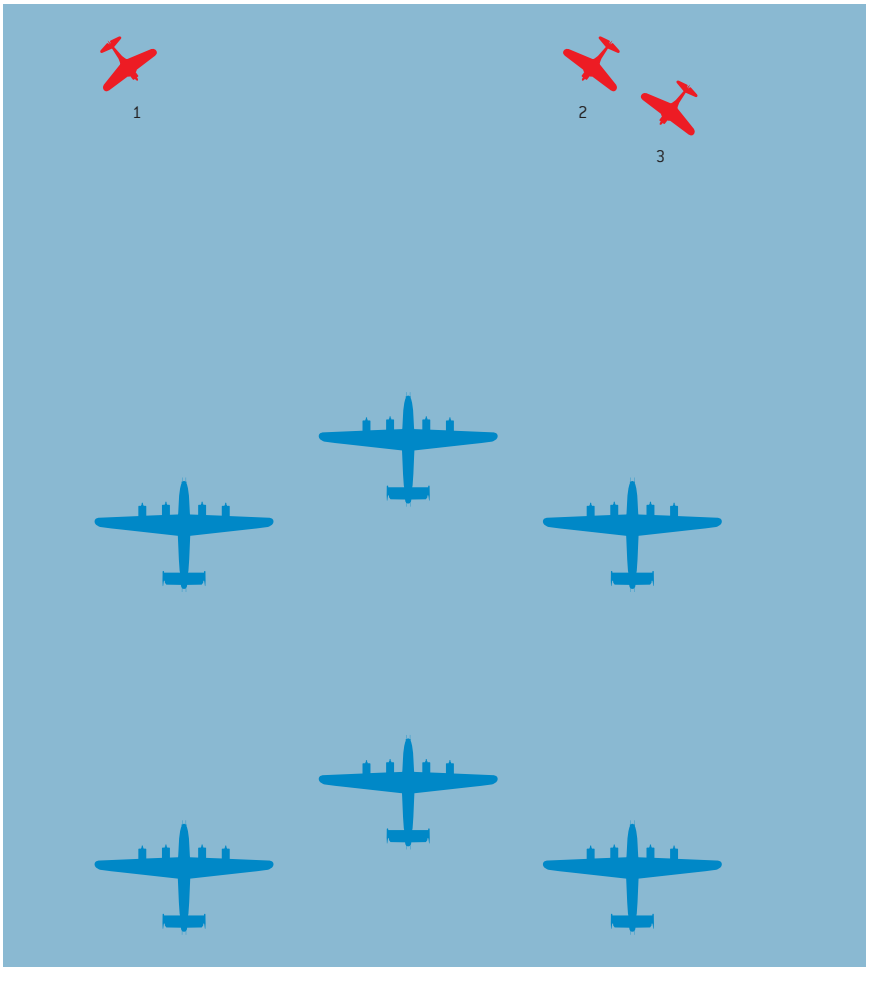
formation. The group had squadrons fly in a column V, a staggered V, a V of Vs and in a diamond formation. The squadron diamond formation consisted of six aircraft flying in a triangle, with the lead element forming a normal triangle. The right and left aircraft were stepped up 20ft above the lead B-24, with the second element in a line behind the lead element forming the base of the triangle. A group diamond consisted of four squadron diamonds 500ft apart, with one squadron stepped up 500ft, another stepped down 500ft and the fourth squadron flying in the rear in line with the lead squadron, but flying 100ft above.

The 308th tended to send out a greater number of aircraft than the 7th BG, typically from 16 to 22 B-24s. Perhaps because of these greater numbers, as well as the influence of standard USAAF doctrine, the 308th flew most of its early missions without fighter escort, although the latter was available for some of the targets the group attacked. Flying from bases in central China, Fourteenth Air Force P-40s could escort the B-24s to many targets in China and in northern French Indo-China – a luxury unavailable to the 7th BG. After suffering some heavy losses to Japanese fighters in August and September 1943, the 308th changed tactics and flew with an escort of fighters on all but two of its missions for the remainder of the year.

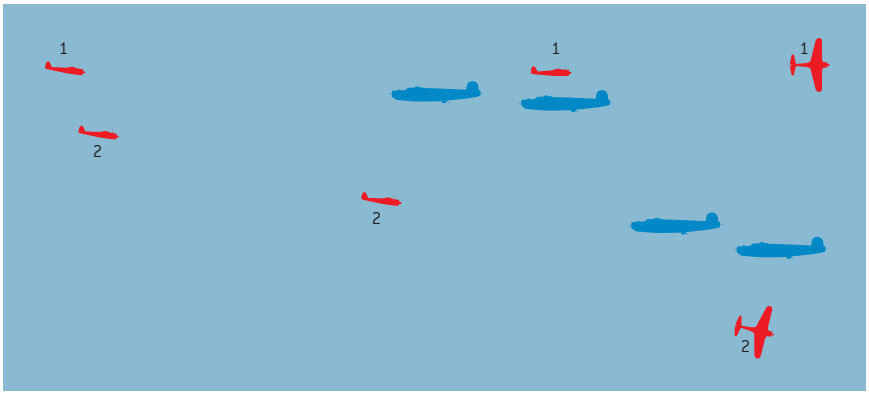
JAAF Ki-43 TACTICS

The Ki-43 "Oscar" pilots in Burma and China found the Liberator to be both a formidable and, at times, intimidating opponent. The Japanese pilots knew that the B-24 was well-armed and well-protected with multiple gun turrets, flexible machine guns covering most approaches, self-sealing fuel tanks and armor protection for the pilots. The Liberator was half-again as long and its wingspan twice as wide as the

Flying out of range of the gunners, an "Oscar" pilot pulls ahead of a B-24 formation in order to make another frontal attack. (7th BG(H) Historical Foundation, USAFA McDermott Library)



The majority of fighter attacks on B-24 formations came from the front quarter, with Ki-43s approaching from the "ten" and "eleven o'clock" and the "one" and "two o'clock" positions. The fighters would attack singly, in pairs or occasionally in combination, engaging a formation from different directions. Sometimes, one fighter or pair would come in ahead of the other to attract the return fire from the killing pair following close behind. At other times frontal attacks would be coordinated with feint attacks to the side of a formation.



JAAF fighter pilots would often press their attacks to point blank range, before breaking away at the last possible minute. A pair of fighters might break away in different directions, one going right through the bomber formation (1) and the other diving under the Liberators (2) in an effort to break up the bomber gunners' return fire. The fighters, if undamaged, would turn around and parallel the B-24 formation, remaining out of range of the bombers' guns as they set up another frontal attack.

RAF's Bristol Blenheim, and bigger than the more familiar Mitsubishi Type 97 Heavy Bomber (Ki-21). One Japanese pilot likened the B-24, with its long, out-stretched wings, to a fighter beckoning his opponent to come and attack, while another pilot recalled that attacking a Liberator felt like attacking an impregnable fortress.

Sgt Maj Satoshi Anabuki, who was the JAAF's leading ace, first engaged B-24s over Rangoon on January 26, 1943. (Yasuho Izawa)

As executive officer of the 64th Sentai, Capt Yasuhiko Kuroe (left) helped develop tactics to counter the B-24s. Kuroe was the highest-scoring ace in the 64th Sentai. (64th Sentai Association)

The pilots recognized that with only two 12.7mm machine guns, shooting down a B-24 would not be an easy task. Despite these reservations, the aviators of the 50th and 64th Sentais, who were the first to encounter the B-24s in daylight raids over Burma, were determined to develop tactics that would bring them success in their encounters with the massive American bomber.

The 50th Sentai was the first to engage in combat with the B-24 over Rangoon. In his memoir written after the war, Sgt Maj Satoshi Anabuki (the leading ace of both the 50th Sentai and the JAAF in World War II) recorded this first encounter, which took place on January 26, 1943. Anabuki recalled that he and his fellow pilots were excited at the prospect of having the B-24, America's supposedly invulnerable bomber, in their grasp. He was flying one of six Ki-43-Is with the 50th Sentai's 3rd Chutai on alert at Mingaladon airfield when at around 1400 hrs they received a report of B-24s approaching Rangoon.

Hurriedly taking off and climbing to altitude, Anabuki spotted two formations of three and four dark green bombers (the seven B-24s were from the 9th and 493rd BSs). Anabuki's "Oscar" was armed with two 12.7mm machine guns. He made repeated attacks on the formation, attacking from the front and the rear quarter, seeing hits that caused white smoke to trail from the engines of one of the bombers. He was targeted by heavy return fire. The other "Oscars" in the formation attacked as well, with sobering results. While Anabuki had claimed a B-24 shot down, the Liberators had managed to damage every attacking Ki-43 which, one by one, had had to drop out of the fight. In fact, neither of the B-24 squadrons lost an aircraft – two bombers from the 493rd received minor damage.

The latter unit's squadron history recorded that the formation had been harassed by Japanese fighters, but without "the least effect on the formation." To their frustration, Anabuki and the other 50th Sentai pilots learned that the B-24 was a strong aircraft, and not as easy to shoot down as they had assumed.

In February 1943 the 64th Sentai took over responsibility for the defense of Rangoon and southern Burma, operating out of Toungoo, while the 50th Sentai withdrew to re-equip with the Ki-43-II. The 64th took up the task of devising tactics to defeat the B-24, having had some experience flying against a captured B-17 while in Singapore. The pilots practiced making attacks from all angles, but particularly from the front. Capt Yasuhiko Kuroe, soon to be promoted to executive officer of the Sentai, believed that this experience gave his pilots confidence in their fighting skills, as well as improving their morale. But the 64th Sentai's

initial combats with the B-24 brought the same feeling of frustration that Anabuki and the pilots of the 50th Sentai had encountered.

Yohei Hinoki, another 64th Sentai ace who survived the war, recalled his feeling that no matter how much the "Oscar" pilots shot at the B-24s, they would not go down. In one instance that Hinoki recorded in his memoir, five "Oscars" attacked a single B-24, firing more than 1,000 rounds at the big bomber, only to watch it fly serenely on as if nothing had happened. Hinoki realized that the Hayabusa did not have the technology that was needed to defeat the B-24, but he and the other 64th Sentai pilots would have to fight on regardless.

The pilots debated among themselves what tactics would be best, working out different approaches with small models of the Hayabusa and the B-24. In his post-war memoir of his experiences, Kuroe wrote of their frustration at fighting this "miserable battle," with its lack of success. Kuroe came to realize that the frontal attack was the most effective means of combating the B-24. When undertaking an attack the fixed guns of the Hayabusa were more effective than the flexible weapons fitted in the nose of the big bomber, but the disadvantage was that approaching from the front was difficult, and there were not a lot of chances. Even if a pilot was successful in shooting at a B-24 during a frontal attack, the combined power of an American bomber formation was still formidable, and invariably the Hayabusas would be hit as they shot past the Liberators.

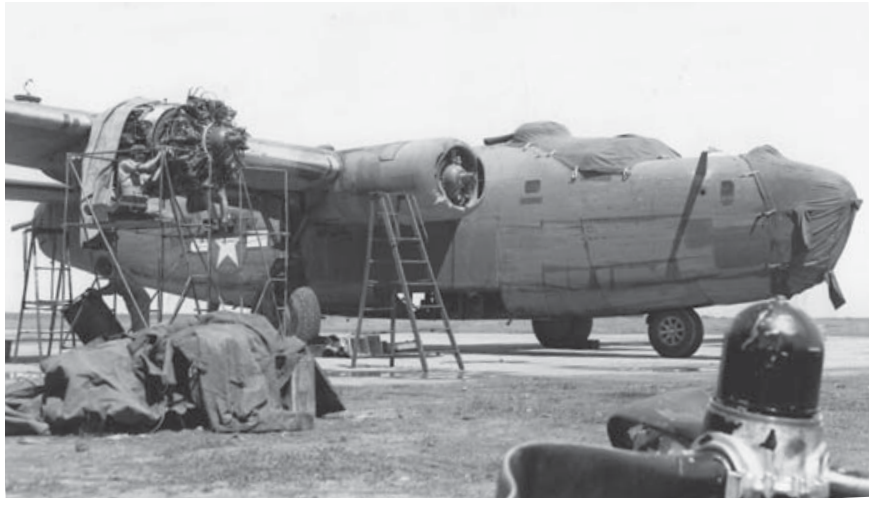
Lt Yohei Hinoki had no illusions about the weaknesses of the Ki-43, or the difficulty of confronting a B-24 in a fighter that was inadequate for the task. Nevertheless, his determination never wavered. Hinoki fought with the 64th Sentai until badly wounded intercepting the November 27, 1943 raid on Rangoon. (Yohei Hinoki)

While the 64th Sentai managed to damage a number of B-24s, it was not until March 13, 1943 that it achieved success. On that date the 9th BS sent out four Liberators to attack the Pazundaung railway bridge at Rangoon. Seven Ki-43s attacked the formation and managed to mortally damage the bombers flown by Capt James Baldwin and Lt Willard Short. The two aircraft staggered away from Rangoon, but both crashed in the Gulf of Martaban, a few miles off the coast of the Irrawaddy River delta, killing both crews. The identities of the successful 64th Sentai pilots are not known.

At the end of the month the 64th scored again. On March 31 Capt Kuroe was leading 13 Ki-43s to Chittagong when they came across a formation of around 12 B-24s. That day the 7th BG had sent out 24 bombers from all four of the group's squadrons to attack a railway bridge at Pynmina, in central Burma, but the formation had to separate when it encountered bad weather. The 9th and 493rd BSs were flying together toward the target when they ran into the Ki-43s. Kuroe immediately attacked a 9th BS B-24 from the rear, although his own aircraft was hit by fire from other bombers. He and his wingman managed to shoot down the Liberator, which was flown by Lt Lloyd Jensen.

The other fighters attacked the 493rd BS formation. Col Conrad Necrason, leading the 493rd's second element, and his co-pilot were wounded when an explosive shell hit the front windscreen of their B-24. In these attacks Capt Hideo Miyabe, leader of the 64th Sentai's 2nd Chutai, had his aircraft hit in the engine and he was forced to crash land. Five other Ki-43s were also damaged, three having to force-land on nearby airfields.

This B-24D from the 9th BS was damaged in one of the missions flown against targets in Burma during the autumn of 1943. (7th BG(H) Historical Foundation, USAFA McDermott Library)



During the following two months 64th Sentai pilots managed to score only a single victory over the B-24s at a cost of three of their own aircraft and one pilot. On May 1, Capt Miyabe led four Ki-43s in an attack on eight 492nd BS B-24s attacking Rangoon. Out of ammunition, Sgt Miyoshi Watanabe rammed the tail turret of 1Lt Robert Kavanagh's B-24, which Lt Hirao Yukimoto and WO Takahama then shot down when Kavanagh dropped out of formation. A week later, on May 7, the 9th and 493rd BSs sent out 15 aircraft to bomb the railway marshaling yards at Toungoo. A flight of four Ki-43s attacked the 493rd's formation of six B-24s but came out of the battle with one "Oscar" shot down and another so badly damaged its pilot had to crash land. The 493rd suffered no losses, although five out of the six aircraft were damaged, two heavily.

Four days later, Lt Hirao Yukimoto was killed attempting to land his damaged Ki-43 after a running battle with the 493rd BS. Crews from the latter unit noted that on this occasion the "Oscar" pilots "seemed to lack courage and decision to press home their passes."

In their memoirs, both Capts Kuroe and Miyabe speak of the mental strain the 64th Sentai pilots were going through in their battles with the B-24s at this time. For pilots inculcated with an aggressive spirit, trained to take the offensive, and with a string of victories over Allied fighters behind them, adopting a more passive defensive role, and their relative lack of success against the Liberators, was demoralizing.

Kuroe recorded that on at least one occasion when leading an interception he could tell his pilots seemed reluctant to attack the bombers, and their attacks did not seem to be aggressive. He realized that attacking a B-24 required the right spirit, a determined attitude of "throwing yourself at the enemy," but also that when confronting the big bombers one had to be calm, calculating and totally concentrated on the attack, not hasty or irrational. He understood that not every pilot could manage this. Kuroe and Miyabe came to the conclusion that the best way to attack a B-24 was from the front and slightly above, and this became the standard tactic. Miyabe added a refinement – have the fighters make concentrated attacks on a single aircraft, thereby

The 25th Sentai converted to the Ki-43-II in June 1943 and made good use of its new fighters in battles with the 308th BG's B-24s using tactics developed by the Burma-based Hayabusa sentais. (Yasuho Izawa)

increasing the chances of knocking it down, and thus reducing the defensive fire from the B-24 formation.

For the American bomber crews on the receiving end of these attacks there were sometimes heart-stopping moments as the Ki-43s raced through a formation. With a high closing speed, there was not much time for the bombardiers or navigators manning the nose guns to aim and fire. Often, the best that could be done was to give the approaching fighter plenty of lead so that the pilot could see the approaching tracers – what Kuroe described as an "infinite number of lights" coming up at him. And the "lights" went both ways. Robert Woodward, a navigator with the 493rd BS/7th BG, recalled:

> It was something to see the firing from the Japanese fighters as they attacked us head on. Each attack lasted only a few seconds at a closing rate of around 600mph. The leading edge of their wings [sic] just blazed with fire, with an occasional brighter flash as they fired their cannon.

Thomas Sledge, who kept notes on all his missions, recorded on one instance how a Ki-43 "made me terribly unhappy" when it approached on what he thought certain was a collision course. But the 7th BG believed it was far better to risk a collision through maneuvering into the attacking fighters than to provide the latter with a steady target. Lt Alfonso Perez, a bombardier with the 9th BS/7th BG, wrote the following description of the combat of May 7, 1943:

> We were out of the target area when someone called "Pursuit at 'nine o'clock'." I peered out, but couldn't see a thing. Still someone kept reporting it. "It's up at 'ten o'clock' now and is climbing. It looks like he's coming in!" Then all of a sudden I saw him. A speck in the distance, moving parallel to us and apparently trying to make up his mind whether to come in or not. He was at about "11 o'clock" when he made his turn to come in. I could see our tracers reaching out for him. He kept coming – he was high, and it seemed

A Ki-43-II of the 33rd Sentai's 2nd Chutai sits in the open at Canton in the late summer of 1943. Note the sentai's distinctive insignia on the tail of the "Oscar." Very few photographs of 33rd Sentai Hayabusas have come to light. (Yasuho Izawa)

like he was going to crash right into the formation, bullets flying at him from all directions. He came straight, straight. Suddenly, just as he seemed about to crash into the second element, he flipped onto his back and miraculously went through the second and third elements. He came out directly underneath our right wing, trailing black smoke. All possible guns were on him, including ours. We headed back, and later our rear gunner reported that the enemy pilot had bailed out and the plane spun in.

Following four months of combat between the 7th BG's B-24s and the 50th and 64th Sentais' Ki-43s, honors were essentially even. The 7th had lost four Liberators and the Japanese four Ki-43s, although each side had suffered considerably more aircraft damaged. The B-24 gunners had claimed 14 enemy fighters shot down, five as probables and 18 damaged. Japanese fighter tactics probably contributed to the over-claiming that was common amongst bomber gunners in all theaters. A gunner firing at a fighter racing through a formation, seeing hits, and then seeing the fighter flip over and dive away would quite naturally believe that he had shot the enemy aircraft down.

Thanks to the employment of good tactics the B-24s had managed to survive long running battles with the Hayabusas and escape with relatively few losses. In turn, the Ki-43 pilots had perfected their own tactics for dealing with the American bombers – concentrated frontal attacks – but the Hayabusa's limited firepower made it difficult to inflict punishing damage against the B-24s, unless the Japanese could attack in sufficient numbers. A flight of six Ki-43s, which was often the most the 64th Sentai could put up against a Liberator formation, brought only a dozen 12.7mm machine guns to bear. A few months later, the Ki-43 sentais in China would demonstrate what a formation of 20 or more fighters could do to a B-24 formation. With the right tactics, in the right circumstances and in adequate numbers, even the poorly armed "Oscar" could be effective against the B-24.

THE BATTLES OVER CHINA

After a month of hauling fuel, bombs and other supplies over the "Hump," the 308th BG flew its first combat mission on May 4, 1943 when 18 aircraft from all four of the group's squadrons attacked the airfield and harbor at Samah Bay, on the southern coast of Hainan Island. Four days later the 308th had its first encounter with Japanese fighters during a combined mission with B-25s of the 11th BS – and P-40 escorts – against the JAAF's Tien Ho airfield in Canton, China. A flight of 11 to 15 fighters (most likely Ki-43s from the 33rd Sentai, then based at Canton) rose up to intercept the American bombers. Several aircraft attacked the 374th BS, which claimed three shot down and two damaged.

On the last day of the month nine aircraft from the 374th and 425th BSs attacked Ichang, in central China, with an escort of P-40s. A group of some 20 fighters intercepted the formation and quickly became engaged with the Warhawks. The bombers continued on to the target, where they encountered a second enemy formation of 20+ fighters, which they identified as "Army Zeros" – obviously Ki-43s – from the 25th Sentai. In the ensuing battle the B-24s claimed 20 fighters shot down and an additional five probables, with only minor damage to three bombers.

Some two months later, on July 27, the 308th returned to Samah Bay, where 16 B-24s ran into 20 to 30 Japanese fighters, most likely from the 33rd Sentai. The fighters attacked the Liberators for 30 minutes, making attacks from the front quarter and the rear. Although the JAAF pilots failed to shoot any of the bombers down, one B-24 was severely damaged, limping back to base with an engine out and another smoking badly. The bombers claimed 13 Japanese fighters shot down and another four probables, this tally being revised to 14 destroyed and six probables. These early missions must have been comforting to the Fourteenth Air Force command, for in three encounters the B-24s had claimed 37 Japanese fighters shot down without loss.

Faced with an increasing number of raids, the JAAF had quickly acted to improve the strength of its fighter force in China. In June the 25th Sentai had returned to Japan to re-equip with the Ki-43-II, heading back to its main operating base at Hankow a month or so later. It appears that both the 25th and 33rd Sentais contacted their counterparts in Burma to learn the tactics they had employed against the B-24s over Rangoon. The pilots of the two sentais also received training in head-on attacks. It is interesting to note that in the battle over Samah on July 27 roughly half the attacks against the B-24s came from the front at a level that was below the fire from the top turret, the fighter then passing underneath the bomber it was attacking. This was perhaps an indication that the lessons from the Burma front had indeed been passed on. They would soon, from the Japanese perspective, be put to good use.

On August 21, the 308th BG sent seven B-24s from the 374th BS and seven from the 375th BS to bomb the docks and warehouses on the Yangtze River at Hankow – a major Japanese supply center. The plan was to have a squadron of B-25s go in at the

OVERLEAF
On August 24, 1943, the 308th BG sent out 14 Liberators to bomb the airfield at Hankow. The formation consisted of seven B-24Ds from the 425th BS, based at Kunming, and an identical number of bombers from the 373rd BS at Yangkai. Weather forced the aircraft from the latter unit to return to their airfield, but Maj Horace Foster, group operations officer leading the 425th BS that day, decided to press on to the target. The 25th and 33rd Sentais were waiting for the bombers over Hankow. Shortly after the Liberators turned off the target Maj Akira Watanabe, commanding the 33rd, led his pilots into the attack, concentrating on the lead aircraft in the formation, B-24D 41-24293 *"Sherazade."* The last Ki-43 in the formation fired an explosive shell into the cockpit, mortally wounding Maj Foster. Gunners on *"Sherazade"* claimed three fighters destroyed and another probable. Without interference from the fighter escort, the 25th and 33rd Sentais managed to shoot down four of the seven B-24s in the formation.

Maj Toshio Sakagawa, commander of the 25th Sentai, led his pilots in several successful battles against 308th BG B-24s in August–September 1943. (Yasuho Izawa)

same time to divert the defenses, while an escort of P-38s and P-40s would cover both formations. These plans went awry, however, when Maj Bruce Beat, CO of the 374th BS, inexplicably decided to head directly to the target without an escort.

The 25th and 33rd Sentais, which had temporarily moved up to the Hankow area, had ample warning of the approaching B-24s. Maj Toshio Sakagawa, CO of the 25th Sentai, led his fighters in a head-on attack as the bombers neared Hankow. Sakagawa, with two other Hayabusas, concentrated on Beat's B-24, setting it on fire. The bomber dived away from the formation in flames, exploding below. The Ki-43s from both sentais then pursued the remaining Liberators relentlessly for the next 27 minutes, the returning bomber crews reporting that the Japanese fighter pilots were very aggressive, pressing home their attacks to close range.

The "Oscars" severely disrupted the 374th BS's run on the target, although the 375th BS managed to hit the docks and warehouses despite also losing an aircraft to the Ki-43s. These were the first B-24s to fall to Japanese fighters over China. Nine other aircraft were damaged to varying degrees. Liberator gunners claimed 57 fighters shot down and 13 probables – more fighters than were actually engaged in the battle, but an indication of how fierce the fighting had been.

Three days later, the B-24s set out again to bomb Hankow. This time it was the turn of the 373rd and 425th BSs, and again the defenders were to be distracted by B-25s attacking at low level – the medium bombers targeted the nearby airfield at Wuchang. An escort of P-38s and P-40s was also scheduled to be provided. Again things did not go quite to plan. The 373rd BS's B-24s could not take off from their base at Yangkai due to weather. Nevertheless, Maj Horace Foster, group operations officer, who had led the 425th BS aloft from Kunming, decided to push on to the target with his

Maj Horace Foster, 308th BG operations officer, was killed piloting B-24D-25 41-24293 "*Sherazade*" on the disastrous mission of August 24, 1943 to Hankow, where Japanese fighters shot down four of the seven B-24s that participated in the raid. (3A-01398, RG 342FH, NARA)

seven B-24s. Only part of the escort – six Warhawks – managed to accompany the Liberators to Hankow.

A few minutes after leaving the target, the 25th and 33rd Sentais attacked the B-24 formation. The Ki-43s made a determined, disciplined attack that lasted 45 minutes. Almost all the passes were from the front quarter, from the "ten," "eleven," "one" and "two o'clock" positions. In many cases a pair of fighters targeted a single bomber, one Ki-43 coming in to attack from each side.

The crew of *Doodlebug*, which was the only bomber to survive the September 15, 1943 mission to Haiphong. This aircraft went on to fly 11 bombing missions and 120 supply sorties over the "Hump." (San Diego Air and Space Museum, 03-00669)

On this day, without interference from the escorting fighters, the sheer weight of numbers took its toll. With four to five times as many Ki-43s involved in these interceptions than had been seen over Rangoon earlier in the year, the 25th and 33rd Sentais shot down four out of the seven B-24s. Tragically, one of the surviving bombers crashed the next day on its way back to Kunming from Kweilin. During the battle the 33rd Sentai lost its commanding officer, Maj Watanabe, probably to the guns of the B-24s, and the 25th Sentai had two fighters downed by the P-40 escorts. With the number of damaged aircraft added to the tally, in two missions the 308th BG had lost nearly a third of its strength. The group did not return to Hankow for some months, and only then at night.

Three weeks later a similar disaster befell the 373rd BS on September 15, 1943. Six B-24s set off to bomb the cement plant at Haiphong, in French Indo-China. One aircraft turned back, while the remaining five continued on to the target, unescorted. Unfortunately for the 373rd, both the 25th and 33rd Sentais were at Hanoi, having escorted Japanese bombers on a raid on Kunming two days before. With ample warning, 35 Ki-43s attacked the small formation of five B-24s, coming in out of the sun.

Using frontal attacks, the "Oscar" pilots shot down three of the bombers. A fourth B-24, damaged in the fighting, crashed on approach to the runway at Kunming. The 25th Sentai lost one fighter to the Liberators. Following this mission to Haiphong, the 308th flew just one more unescorted operation out of China. The group would lose only one more bomber to Japanese fighters during the rest of the year, this aircraft being shot down on a mission to bomb the docks at Kowloon, in Hong Kong, on December 1.

The 308th obtained a small measure of revenge in late October when, in response to fighter attacks on American transport aircraft, Gen Claire Chennault, commander of the Fourteenth Air Force, sent a formation of B-24s over the "Hump" route. In the mistaken belief that they were attacking C-87 transports, a flight of Ki-43s from the 50th Sentai intercepted the bombers, losing three fighters to the Liberators.

During the course of three interceptions the 25th and 33rd Sentais had shot down ten B-24s at a cost of two fighters destroyed. The China-based Hayabusa sentais used the tactics the 50th and 64th Sentais had developed over Burma and, critically, a quantity of fighters sufficient to overcome the Ki-43's weak armament.

B-24Js ARRIVE IN THE CBI

The end of the monsoon season in Burma and the return of better weather in early October coincided with a belated increase in the number of combat crews available to squadrons of the 7th BG. The group could now send out more aircraft on a regular basis. During October it flew six missions, employing 26 to 28 B-24s on each operation, but despite the greater number of bombers the 7th BG lost three Liberators to the 64th Sentai's Ki-43s. A further 25 bombers were damaged to some degree – a very high number. Only one Ki-43 appears to have been downed during the month, the 50th Sentai's 1st Chutai leader, Capt Yoshihiro Takanarita, falling to B-24s over Rangoon on October 4, 1943 during a 45-minute battle. Both the 9th and 492nd BSs claimed to have shot down Japanese fighters during the mission.

Towards the end of October brand new B-24Js began arriving to replace the now-tired D-models, although some pilots and crews parted with the older Liberators reluctantly. The newer J-models boasted nose and belly turrets, and the squadrons expected the added firepower to come as an unpleasant surprise to the Japanese fighters. Indeed, the 493rd BS's history for the month of October 1943 predicted that "90 percent of the attacks in the future will not be from the frontal quarter, and that many a Jap will become aware of that too late." Given these expectations and, at long last, the availability of fighter escorts for the bombers, it is sadly ironic that in the space of just five weeks the 7th BG would lose more B-24Js to Japanese fighters than the total number of D-models the group had lost during the previous nine months.

The increased quantity of aircraft now available and the introduction of the B-24J required the 7th BG to change tactics. When a mission consisted of 24 to 28 aircraft, the outfit shifted to a Group Diamond Formation going to and from the target. In this formation the No. 2 squadron flew on the right, stepped up 500ft above the lead squadron, the No. 3 squadron flew on the left, stepped down 500ft, and the No. 4 squadron flew in a slot position behind, stepped down 1,000ft.

One of the 7th BG's new B-24Js, this aircraft was damaged during the November raids on Rangoon. The nose turret was a welcome addition to the Liberator, but at the cost of severely limited visibility for the bombardier and navigator. (3A-33583, RG 342FH, NARA)

Immediately after bombing the target, the bombers would shift to a Group Defensive Formation to ward off fighter attacks. Nos. 2 and 3 squadrons would echelon down and nearly abreast on the right and left of the lead squadron, while the No. 4 squadron remained in the rear of the formation below the level of the lead squadron. The No. 4 squadron could move laterally from side to side to avoid frontal attacks.

The larger formation size reduced the ability to maneuver as readily as a single squadron in a Javelin Down Formation, but the group continued to use evasive tactics on a lesser scale. With the B-24J's performance limitations compared to the D-model, maintaining formation integrity and air discipline became all the more important. The B-24J proved to be slower than the older Liberator, and it was also less effective at altitudes above 20,000ft. In his report Col Conrad Necrason noted that the combination of slower speed and lower altitude "enabled the Jap to fly rings around the B-24J, even at increased power settings – hence, the policy of concentrating only on formation integrity."

The 7th BG was soon to experience, painfully, what happened when formation integrity broke down during an attack by Japanese fighters. On November 14, a dozen B-24s – six each from the 9th and 493rd BSs – set off on a mission to bomb the barracks at Maymyo, in central Burma. For the first time, the group had an escort of fighters in the form of P-51A Mustangs from the recently arrived 311th FG. Bomber losses in October had persuaded the higher command that the B-24s needed an escort, and finally a fighter had arrived in-theater with enough range to take the Liberators deep into Burma.

With the target at Maymyo clouded over, Maj Wesley Werner, leading the 493rd, turned the formation south toward the secondary target of Pakokku, but the two squadrons became separated. Five minutes later seven Ki-43s from the 50th Sentai intercepted the 493rd formation, and for the next 50 minutes the fighters made repeated attacks from the front and all quarters. Three B-24s, including the aircraft of Maj Werner, fell to the Ki-43s, but the mission proved just as costly for the 50th Sentai – three fighters were shot down, with one pilot killed, and one fighter crash-landed.

The last days of November and the first day of December witnessed the largest bombing missions yet flown in the CBI theater, the heaviest air combat with Japanese fighters and the greatest losses of B-24s. The air battles that took place over Rangoon during the course of these missions represented something of a swansong for the Ki-43 Hayabusa in its role as an interceptor in the CBI. The change in fortunes between the JAAF and the Allied air forces in Burma and China would see the Ki-43 shoot down only two more B-24s for the remainder of the war.

The formation of South East Asia Command (SEAC) in August 1943 finally permitted the integration of Allied air units into a combined command structure that facilitated greater coordination of effort. This included the formation of the Strategic Air Force by combining RAF and USAAF heavy bomber units in India.

Maj Gen George Stratemeyer, newly appointed commander of Eastern Air Command, wanted to launch a series of day and night raids to render Rangoon ineffective as a base for supplying the Japanese Army in Burma. RAF Wellington and Liberator bombers would attack by night, and Stratemeyer asked Claire Chennault to

ENGAGING THE ENEMY

The Ki-43-II benefited from an improved gunsight and heavier armament. The Ki-43-I used the Army Type 89 Sighting Telescope, which extended into the cockpit and had a soft rubber eye piece for the pilot to rest against while sighting. In combat, the sighting telescope proved difficult to use in a high-speed maneuvering battle. With his eye glued to the sighting telescope, a pilot's field of vision was sharply narrowed, and he would have lost the use of his peripheral vision – both vital to situational awareness.

With the Ki-43-II, the JAAF introduced the Army Type 100 reflector gunsight. It was equipped with a standby ring-and-bead sight that could be quickly flipped into place if the gunsight's reflector light failed to work.

Early reliability problems with the Ho-103 weapon had been resolved by the time the Ki-43-II entered service. This "Oscar" variant had two Type 1 (Ho-103) machine guns in the nose, which simplified aiming during a straight-on frontal approach.

Frontal attacks called for exceptional calm and concentration – a difficult proposition even for the bravest of pilots. Capt Yasuhiko Kuroe told his 64th Sentai pilots that the initiative lay with the attacker, "so attack boldly, go into the wall of fire and take their bullets, be relentless."

send the 308th BG to India to reinforce the 7th BG for the daylight missions. Upon arrival in India the 308th re-equipped with B-24Js.

The Mustangs of the 311th FG and the P-38 Lightnings of the newly formed 459th FS would provide an escort to the B-24s. The increase in Allied air activity and the introduction of new fighters (the first RAF Spitfires had also recently arrived) did not go unnoticed by the 5th Hikoshidan, which called for reinforcements. During November the JAAF sent the 33rd and 204th Sentais to Burma, effectively doubling the number of Ki-43s available to the 5th Hikoshidan. In addition, the 64th Sentai received a small number of the newer Type 2 Fighters (Ki-44s).

Newly arrived 204th Sentai pilots are seen at Mingaladon in late 1943. Future aces WO Bun-ichi Yamaguchi (far left) and Lt Hiroshi Takiguchi attacked B-24s over Rangoon on the night of February 29/March 1, 1944 and claimed two of them shot down. (Yasuho Izawa)

The first mission to Rangoon, on 25 November, was scrubbed due to weather. Two days later the 7th BG sent out 28 B-24s, along with 28 aircraft from the 308th BG and an escort of P-38s and P-51s, to bomb the Insein locomotive repair shops in Rangoon. Capt Kuroe led nine Ki-43s from the 64th Sentai's 3rd Chutai to intercept the formation, first attacking the escort of P-38s and P-51s, then the bombers. The Ki-43s targeted the 7th BG's formation, which was leading the bombers, knocking out two engines on the 493rd BS B-24J flown by Lt Stephen. After leaving the target area the group stayed with Stephen for as long as possible, and then the fighter escort took over until he managed to make a water landing off the coast, his crew surviving.

Then it was the turn of the following 308th BG to be attacked. Although the group did not think the Japanese fighters were particularly aggressive, a B-24J from the 373rd BS and an aircraft from the 374th BS were both shot down. Lt Yohei Hinoki claimed two Liberators destroyed, but lost a member of his flight to the bombers' return fire, the pilot bailing out. The 21st Sentai also claimed a bomber shot down. The B-24s returned to Rangoon the next day, but this time the escorting P-51s kept the 64th Sentai's Ki-43s at bay.

After spending several days conducting maintenance and repair work, the B-24 groups returned to Insein on December 1. The 308th BG sent out 30 bombers to join 28 from the 7th BG that were leading the formation, again with an escort of P-38s and P-51s. Seven B-24s from the 7th and an identical number from the 308th turned back before reaching the target for various reasons, leaving 44 to attack Insein. On this day the Japanese fighters were up in force, with the 21st, 64th and 204th Sentais all taking off to intercept the incoming bombers with some 50 fighters. Ten minutes before reaching Rangoon an estimated 20 Ki-43s and ten Ki-45s tore into the 7th BG formation in a determined frontal attack. Another group of ten or more Ki-43s and several Ki-45s attacked the 308th BG formation at the same time. The 9th BS, leading the 7th BG, bore the brunt of the assault.

NCO pilots of the 64th Sentai's 3rd Chutai pose for the camera in front of the Ki-43 of chutai leader Capt Yohei Hinoki at Mingaladon airfield. These newly joined pilots, fresh from a training school in Japan, got their first taste of combat over Rangoon on December 1, 1943 when airfields in and around the Burmese capital were bombed by B-24s. (Yoji Watanabe)

The fighting went on for nearly an hour, with the Ki-43s making repeated passes from the front quarter. The 64th Sentai pilots concentrated on the lead aircraft, shooting down the B-24 of Capt William Wright, the squadron operations officer who was leading the unit that day. The Liberator flown by Lt Carl Carpenter, who was on only his second combat mission, was seen to blow up in mid-air. Then a third bomber went down in flames. The 436th BS had a B-24 crippled by anti-aircraft fire and then finished off by fighters, the left wing and engines of Lt John McLauchlen's bomber trailing smoke as he pulled his Liberator out of the formation. Three Ki-43s immediately went after him, these machines almost certainly being flown by Capt Kuroe and WOs Kinoshita and Yamazaki. After a long chase they shot McLauchlen's aircraft down into the jungle. The 493rd BS lost a B-24 in similar circumstances, flak forcing Lt Granville Stringfellow to fall away from the squadron, whereupon eight to ten Ki-43s pounced on him and finished his bomber off.

The 308th BG lost only one B-24, but its destruction disrupted the group's attack nevertheless. Coming in out of the sun, and again concentrating on the lead aircraft (flown by Maj Paul O'Brien), the Ki-43s shot the Liberator down just before the 308th had started its bomb run. In the confusion that followed five aircraft flew past the primary target, three more missed it with their bombs and only 15 dropped on the railway works. The 308th found the Japanese pilots to be very aggressive, making repeated attacks over a 30-minute period.

During the fighting the 64th Sentai lost two aircraft. Lt Sanae Ishii appears to have been shot down and killed attacking the 7th BG formation, while Cpl Hidezo Ishida managed to bail out of his stricken Ki-43. Four more fighters were damaged. The 64th Sentai claimed seven B-24s shot down that day, while the 204th Sentai, in its first action in Burma, claimed two and the Ki-45-equipped 21st Sentai one.

This turned out to be the last duel of its kind between the B-24 Liberator and the Ki-43 Hayabusa, as they would never confront each other again in such circumstances. On a pure numbers basis, the Ki-43 had won the round. Once again, as in China, the quantity of intercepting fighters was the deciding factor.

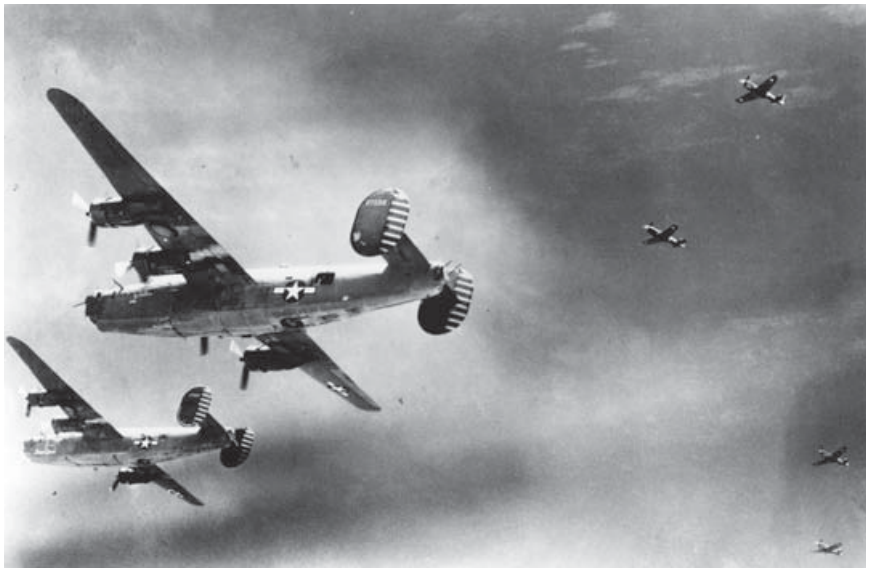
STATISTICS AND ANALYSIS

With its limited armament, the Ki-43 was far from an ideal interceptor. Yet, despite this limitation, during 1943 the "Oscar" units in Burma and China managed to inflict more losses on 7th and 308th BG B-24s than they themselves suffered. For much of the year the 50th and 64th Sentais in Burma and the 25th and 33rd Sentais in China had to bear the greater portion of the air defense and air superiority burden, shifting between the two roles as the situation required.

Most, if not all, of the Ki-43 pilots realized that the "Oscar" was not suited to the task of intercepting B-24s, and they longed for a more capable fighter that was both faster and better armed. Still, they had no choice but to fight on with what they were given, regardless of their own doubts. Through trial and error the Ki-43 sentais in Burma developed effective tactics for attacking the B-24 – target the aircraft from the front quarter, aim at the cockpit or the engines and make concentrated, repeated, attacks on a single bomber, preferably the lead Liberator in a formation.

The attacks on the lead aircraft were at times particularly successful, and they cost the 308th BG three squadron commanders and the group operations officer over a period of just four months. Often, the loss of the lead ship disrupted the group's bombing run on the target, which was in itself a victory for the interceptors. What hampered the 64th Sentai in the first half of the year, when it had primary responsibility for the defense of Rangoon, was the lack of a sufficient number of aircraft to bring to bear against the B-24s.

Outside of a lucky hit, the key to downing a Liberator was weight of fire – the quantity of rounds needed to destroy or disable the crew or vital components, or start a fire. Sgt Anabuki of the 50th Sentai believed that in a frontal attack, at rapid closing



After suffering heavy losses on unescorted operations, the 308th BG changed tactics and employed a fighter escort on missions where Japanese fighter opposition was expected. This photograph shows B-24J-25 42-73253 *Burma Queen* (one of the 308th BG Liberators that participated in the November–December 1943 Rangoon missions) leading B-24J-35 42-73318 *Karachi Kourier* with an escort of P-40 fighters later in 1944. (3A-00957, RG 342FH, NARA)

speeds, an experienced Ki-43 pilot could get off up to 120 rounds of 12.7mm ammunition from his two machine guns in five to six bursts, not all of which were guaranteed to hit the target. Between 50 to 60 rounds of 12.7mm ammunition would be roughly equivalent in weight to the 20+ 20mm cannon shells that the Luftwaffe thought necessary to bring down a large bomber. However, 12.7mm ammunition had less explosive power than a 20mm shell, so it would likely require more than 50–60 rounds to match 20 cannon shells.

Given the limited number of passes a Ki-43 could make against a B-24 formation, the greater the number of "Oscars" available the greater the likelihood of shooting down a B-24, as the 25th and 33rd Sentais found in China. The air combats between

Lt Takashi Tomomune (in his summer flying suit) of the 50th Sentai led a flight of four Ki-43s against 12 B-24Js of the 493rd BS/7th BG on November 14, 1943. Two "Oscars" and one pilot were lost to intense defensive fire, but the 493rd BS suffered a severe mauling nonetheless. (Yasuho Izawa)

the Ki-43 and the B-24 in the second half of 1943 demonstrated that in the right circumstances, with the right tactics, experienced pilots, a sufficient number of aircraft and, critically, in the absence of escorting fighters, the "Oscars" could inflict significant losses on a formation of Liberators.

The Tenth and Fourteenth Air Forces did not allow these ideal circumstances to continue. The advocates of strategic, high-altitude, daylight precision bombing in the USAAF had begun the war with an unshaken faith that a disciplined formation of well-armed heavy bombers would be able to reach their targets and return, unescorted, with minimal losses. The experience of the 7th BG over Burma during the first half of 1943 seemed to vindicate this conviction. In six months of combat the 7th lost only four B-24s (though many more were damaged) and repeatedly fought off the attacking Japanese fighters in running battles lasting nearly an hour. A report on B-24 tactics over Burma even said that fighter opposition encountered during this period "was relatively unimportant." This experience may have given commanders in the Tenth and Fourteenth Air Forces a false sense of security.

The 64th Sentai in Burma was rarely able to send up as many as a dozen Ki-43s to intercept the B-24s. What would happen if this number was doubled, or tripled? The answer came in the air battles over China in August and September 1943. The loss rate on the 308th BG's mission to Hankow on August 24, 1943 was 57 percent, while on the mission to Haiphong on September 15, 1943, the loss rate was a staggering 80 percent. The 7th BG also experienced days of heavy losses that autumn. On two occasions – on the missions of November 14 and December 1 – one of the group's squadrons, the 9th BS, suffered losses of 50 percent. The 7th BG's group loss rate on the December 1 mission to Rangoon was 24 percent. Clearly, these loss rates were unsustainable.

The losses the 7th and 308th BGs suffered in the autumn of 1943 occurred at a time when the entire premise of unescorted, daylight precision bombing was being called into question. The infamous second Schweinfurt mission on October 14, 1943 effectively disproved the theory that a formation of heavily armed bombers could penetrate enemy air space and return unescorted with acceptable losses. The American heavy bomber proved to be far more vulnerable to enemy fighters – even weakly armed fighters like the Ki-43 in sufficient quantity – than the USAAF bomber advocates had anticipated.

The solution to the problem of protecting the bomber force, in every theater of war, was the long-range escort fighter. These began to arrive in the CBI in the form of P-38s and early model P-51s, but initially in insufficient numbers. For example, on the mission of December 1, 1943, only 15 Lightnings were available to cover the bomber force. But once the need for long-range fighters was identified, and the technology of auxiliary fuel tanks solved, the problem became one of production, and that was addressed. As the war went on, more long-range fighters became available in the CBI. The 7th and 308th BGs shifted to having escorts on all missions where Japanese fighters might be present.

During 1943 the 7th and 308th BGs each lost 15 aircraft to Ki-43s, this figure being as near as can be determined given the intensity of some of the air battles and the fact that both anti-aircraft fire and the Ki-45s of the 21st Sentai played a role in the skies over Burma. Having spent more time performing the air-defense mission

50th Sentai ace Sgt Maj Yojiro Ohbusa was also involved in the November 14 B-24 intercept, which saw two 493rd BS bombers shot down. However, Ohbusa's aircraft was hit so severely by defensive fire that he too had to take to his parachute. He claimed 19 victories and survived the war. (Yasuho Izawa)

than the other fighter sentais, the 64th Sentai nominally was the leading scorer against the B-24 with around 16 victories for the loss of ten Ki-43s. The 25th Sentai would be second in the rankings, although it is difficult to state exactly how many victories it scored as some of unit's successes were clearly achieved when operating alongside the 33rd Sentai.

Determining the ranking Ki-43 ace against the B-24s is even more difficult, as detailed records did not survive the war. Capt Nakakazu Ozaki with the 25th Sentai was credited with six victories against the Liberator over China, earning him the nickname "B-24 killer." In Burma, Capt Yasuhiko Kuroe, leader of the 64th Sentai's 3rd Chutai and later the sentai's executive officer, was probably the leading scorer against the B-24 when his own individual victories and victories scored with the participation of other pilots are taken into account.

USAAF bomber and JAAF fighter losses over Burma and China in 1943

Date	USAAF unit	B-24s lost	JAAF unit	Ki-43s lost
March 13	7th BG	2	64th Sentai	0
March 31	7th BG	1	64th Sentai	1
May 1	7th BG	1	64th Sentai	0
May 7	7th BG	0	64th Sentai	2
May 11	7th BG	0	64th Sentai	1
August 13	7th BG	0	64th Sentai	1
August 21	308th BG	2	25th Sentai	0
August 24	308th BG	4	25th & 33rd Sentais	1
September 13	7th BG	0	64th Sentai	1
September 15	308th BG	4	25th & 33rd Sentais	1
October 4	7th BG	0	50th Sentai	1
October 14	7th BG	1	64th Sentai	0
October 18	7th BG	1	64th Sentai	0
October 26	7th BG	1	64th Sentai	1
October 27	308th BG	0	50th Sentai	3
November 3	308th BG	1	25th Sentai	0
November 14	7th BG	3	50th Sentai	4
November 27	308th BG	2	64th Sentai	1
November 27	7th BG	1	64th Sentai	0
December 1	7th BG	5	64th & 204th Sentais	1
December 1	308th BG	1	64th & 204th Sentais	1
December 24	308th BG	1	25th Sentai	0
	Total losses	**31**	**Total losses**	**20**

AFTERMATH

By the beginning of 1944 the JAAF had entered a period of inexorable decline. As the full weight of Allied industrial production and air power was brought to bear on Japan's rapidly crumbling defensive perimeter, the JAAF had no adequate response to what had turned into a grinding war of attrition.

In January 1943, the Japanese fighter sentais in Burma faced a combined RAF/USAAF force of roughly 16 fighter, eight medium bomber and four heavy bomber squadrons. By the end of the year the number of Allied squadrons had increased to 24 fighter, five dive-bomber, four medium bomber and seven heavy bomber squadrons. In China the situation was similar. The China Air Task Force, precursor to the Fourteenth Air Force, had one fighter group and one medium bomber squadron at the beginning of 1943. By early 1944 there were five fighter groups, two medium bomber groups and one heavy bomber group.

The Allies built up not just a quantitative superiority over JAAF units but a qualitative superiority as well. Beginning in late 1943 and continuing throughout 1944, the older Hurricanes, Blenheims and P-40s gave way to the superlative Spitfire VIII, P-38, Merlin-engined P-51, P-47, Beaufighter and Mosquito. In China, the Warhawk was gradually replaced by the P-51 Mustang in most fighter units.

The Japanese response to this re-armament came too late to affect the outcome of the war. The JAAF would learn, to its cost, that the "Light Fighter-Heavy Fighter" concept was simply not workable in the heat of combat. Pitting a lightweight air superiority fighter

Long-range fighter escorts were the answer to protecting USAAF bomber formations on daylight missions. With adequate fighter protection, the bombers could fly to their targets and return with acceptable losses. The 459th FS was formed in India with P-38s in October 1943 and began flying escort missions shortly thereafter. (SC-267021, RG 111, NARA)

The fate of many Ki-43s in Burma and China in the later stages of the war. Most were victims of Allied strafing attacks or simply a shortage of spare parts. This 204th Sentai Ki-43-II was found abandoned at an airfield in central Burma. (SQ-LIA-5-45, AFHRA)

(the Ki-43) against the next generation of powerful and well-armed Allied fighters and bombers would prove to be futile. The JAAF realized belatedly that maneuverability *and* firepower had to be combined in a single aircraft.

At the end of 1941 the Koku Hombu issued a requirement to the Nakajima Aircraft Company for a new fighter that would have higher performance and greatly increased armament. This became the Type 4 Fighter Hayate (Ki-84), a formidable aircraft that was the equal of its Allied opponents. Entering production in 1944, the Type 4 was not built in sufficient quantities to make a decisive difference. By the time it was introduced into service the JAAF was on the defensive, facing overwhelming odds on all fronts.

Japanese aircraft production peaked in the summer of 1944 and declined steadily thereafter. Shortages of raw materials, skilled workers and the increasing frequency of B-29 bombing raids disrupted the aviation industry. This in turn meant that JAAF units in Burma and China did not consistently receive enough replacement aircraft to make good their losses. In Burma the 5th Hikoshidan received approximately 70 new fighters a month during the first half of 1944, but in the second half of the year not more than ten replacements arrived. Even servicing aircraft already in the field became problematic. As the US Navy's submarine fleet devastated the Japanese merchant marine, the ability of the JAAF to re-supply its frontline units – never a strong suit of the Japanese Army – was considerably weakened. Many a Ki-43 was lost on the ground during Allied strafing raids due to the paucity of spare parts.

As a result, the 64th Sentai soldiered on with the "Oscar" until the end of the war, converting to the Ki-43-III in August 1944. In other units in Burma and China the Type 4 Fighter gradually replaced the Ki-43, with the 25th and 50th Sentais finally re-equipping with the Ki-84 towards the end of 1944. Other battles drained Ki-43 units away from Burma and China. The 33rd went first to New Guinea and then to the Philippines, where the 204th Sentai joined it in October 1944. In early 1945 the 50th Sentai was pulled out of Burma and sent to French Indo-China, leaving the 64th Sentai in-theater on its own. The 25th Sentai remained in China until the summer of 1945, when it withdrew to Korea.

The loss of experienced pilots and the lack of adequately trained replacements compounded the problem of dealing with Allied quantitative and qualitative superiority. While a number of the leading Ki-43 pilots managed to survive the war, even they were hard pressed when confronting more modern Allied fighters. Newer pilots with as little as 250 flying hours or less stood next to no chance.

During 1944 there were few encounters between the B-24s and the Ki-43s as units on both sides took on different missions. In Burma and China the Japanese fighter sentais were drawn into supporting the Japanese Army's offensives, first in Burma during the battles in the Arakan and around Imphal, and then in China during the *Ichi-Go* offensive that lasted until the end of the year.

In China, P-51 Mustangs gradually took over bomber escort duties from the shorter range P-40s. P-51As joined the 23rd FG in China in October 1943, followed by improved P-51Bs (one of which is seen here) in March 1944. The Mustang's range allowed it to escort the bombers across the length and breadth of China. (3A-49380, RG 342FH, NARA)

In India, the newly formed Strategic Air Force launched a campaign against the Burmese railway system to slow the flow of supplies to the Japanese Army at the front. This presented the JAAF with a more difficult task when it came to intercepting these raids, which ranged across the length and breadth of Burma. In China, the Fourteenth Air Force had the 308th BG switch primarily to attacks against Japanese shipping off the coast. But more importantly, the Ki-43 sentais were simply ground down under the weight of Allied pressure.

Despite sending in reinforcements to support the Imphal operations, in the air battles over Imphal and the Arakan the Ki-43 units suffered severely at the hands of RAF Spitfires, while counter-air operations by the P-38s of the 459th FS and the P-51s of the 1st Air Commando Group devastated Japanese air bases. By the summer of 1944 the Allies had won air superiority over Burma. In June of that year the 5th Hikoshidan had only 60 Ki-43s on strength in Burma. In China, too, despite the loss of so many airfields in the country's central region during the *Ichi-Go* offensive, the Fourteenth Air Force built up an ascendancy that the Japanese fighter units could never overcome.

From the beginning of 1944 to the end of the war, the Ki-43 would manage to shoot down only one more B-24, and by early 1945 the Liberators were flying over Burma and China with impunity.

By the spring of 1945 the Allies had established what amounted to air supremacy in the skies over Burma. In what would have been exceedingly dangerous in 1943, a 7th BG B-24L flies serenely past a Japanese airfield in Burma. (7th BG(H) Historical Foundation, USAFA McDermott Library)

FURTHER READING

BOOKS

Anabuki, Satoru, *Aozora no Kawa: Anabuki Gunso Hayabusa Kusen (The Blue Sky River: Sergeant Anabuki's Hayabusa Chronicle)* (Kojinsha, 1985)

Baldwin, Ben R., *Individual Training of Bombardiers* (Army Air Force Historical Studies No. 5, Assistant Chief of Air Staff, Intelligence, Historical Division, 1944)

Baldwin, Ben R., *Individual Training of Navigators in the AAF* (Army Air Force Historical Studies No. 27, Assistant Chief of Air Staff, Intelligence, Historical Division, 1945)

Biddle, Tami Davis, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas of Strategic Bombing 1914–1945* (Princeton University Press, 2002)

Blue, Alan G., *The B-24 Liberator* (Ian Allan, 1976)

Bowman, Martin W., *Consolidated B-24 Liberator* (Crowood Press, 1998)

Craven, Wesley F. and James L. Cate, *The Army Air Forces in World War II, Volume One: Plans and Early Operations (January 1939 to August 1942)* (University of Chicago Press, 1948)

Craven, Wesley F. and James L. Cate, *The Army Air Forces in World War II, Volume Four: The Pacific: Guadalcanal to Saipan (August 1942 to July 1944)* (University of Chicago Press, 1950)

Craven, Wesley F. and James L. Cate, *The Army Air Forces in World War II, Volume Six: Men and Planes* (University of Chicago Press, 1955)

Dorr, R. F., *7th Bombardment Group/Wing 1918–1995* (Turner Publishing, 1995)

Dunn, Richard J. *Nakajima Ki-43-I Armament – A Reassessment*, www.j-aircraft.com

Foster, John T., *China Up and Down: The 308th Bombardment Group (Heavy) of The Flying Tigers, The Men, The B-24s and The Events from 1943 to 1945* (Academy Books, 1994)

Glines, Carrol V., *Chennault's Forgotten Warriors – The Saga of the 308th Bomb Group in China* (Schiffer Publishing, 1995)

Green, William and Gordon Swanborough, *Japanese Army Fighters, Part One* (Macdonald and Jane's, 1976)
Green, William and Gordon Swanborough, *Japanese Army Fighters, Part Two* (Macdonald and Jane's, 1977)
Harvey, A. D., "Army Air Force and Navy Air Force: Japanese Aviation and the Opening Phase of the War in the Far East," *War in History*, Vol. 6, No. 2 (April 1999)
Hata, Ikuhiko, Yasuho Izawa and Christopher Shores, *Japanese Army Air Force Units and their Aces 1931–1945* (Grub Street, 2002)
Hinoki, Yohei, *Tsubasa no Kessen: Kaerazaru Hayabusa Sentotai (The Hayabusa Battle Unit of No Return)* (Kojinsha, 1984)
Holley, Irving B., *The Development of Aircraft Gun Turrets in the AAF 1917–1944* (Army Air Force Historical Studies No. 54, Assistant Chief of Air Staff, Intelligence, Historical Division, 1947)
Ichimura, Hiroshi, *Osprey Aircraft of the Aces 85 – Ki-43 'Oscar' Aces of World War 2* (Osprey Publishing, 2009)
Kuroe, Yasuhiko, *Aa, Hayabusa Sentotai (Ah, the Hayabusa Fighter Unit)* (Kojinsha, 1984)
Marsh, David and Peter Starkings, *Imperial Japanese Army Flying Schools 1912–1945* (Schiffer Publishing, 2011)
Mikesh, Robert C., *Japanese Aircraft Equipment 1940–1945* (Schiffer Publishing, 2004)
Miyabe, Hideo, *Kato Hayabusa Sentotai no Saigo (Last Days of the Kato Hayabusa Sentai)* (Kojinsha, 1986)
Molesworth, Carl, *Osprey Duel 8 – P-40 Warhawk vs Ki-43 Oscar* (Osprey Publishing, 2008)
Perez, Lt Alfonso B., *A B-24 Bombardier "Over Burma" 1943* (privately published)
Shores, Christopher, *Air War For Burma: The Allied Air Forces Fight Back in Southeast Asia 1942–1945* (Grub Street, 2005)
United States Army Air Forces Intelligence Service: Informational Intelligence Summary No. 44-4, January 30, 1944: "Tactics of a B-24 Squadron Over Burma"
United States Army Air Forces Intelligence Service: Informational Intelligence Summary No. 44-7, February 29, 1944: "B-24 Tactics Over Burma and Thailand"
United States Army Air Forces Intelligence Service: Informational Intelligence Summary No. 44-36, December 15, 1944: "Training Plans for Jap Fighter Units"
Williams, Anthony G., and Dr Emmanuel Gustin, *Flying Guns of World War II: Development of Aircraft Guns, Ammunition and Installations 1933–45* (Airlife Publishing, 2003)
Young, Edward M., *Osprey Combat Aircraft 87 – B-24 Liberator Units of the CBI* (Osprey Publishing, 2011)

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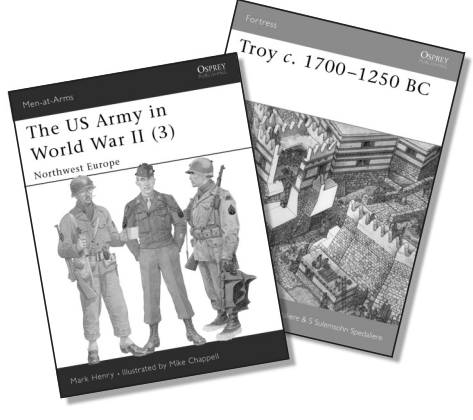

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Editor's note

For ease of comparison please refer to the following conversion table:

1 mile = 1.6km
1yd = 0.9m
1ft = 0.3m
1in. = 2.54cm/25.4mm
1 gallon (US) = 3.8 liters
1 ton (US) = 0.9 metric tons
1lb = 0.45kg

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Title page photograph

A 7th Bomb Group (BG) crew gather in front of their B-24D Liberator at a base in India in 1943. (3A-37849, RG 342FH, National Archives and Records Administration (NARA))

B-24 Liberator cover art

B-24D 41-23921 *"Sittin' Bull"* was one of the first Liberators assigned to the 7th BG's 493rd BS in early 1943. On September 6 that year, this aircraft and five others from the unit participated in a group mission to bomb the docks and shipping in Rangoon. At 22,000ft over the city, a group of eight to twelve Ki-43 "Oscars" and Ki-45 "Nick" fighters attacked the formation shortly after "bombs away." In a running battle lasting nearly an hour, the fighters made more than 30 passes at the B-24s. The attacks were relentless, with some of the Japanese fighters closing to as little as 50 yards from the bombers before breaking away above and below them. The 493rd crews claimed two Ki-43s and one Ki-45 as "probables," suffering no damage in return. *"Sittin' Bull"* completed 56 missions with the 493rd and, renamed *"Rangoon Rambler,"* returned to the United States in November 1943 to undertake a bond tour. (Cover artwork by Gareth Hector)

Ki-43 cover art

In February 1943, the 64th Sentai took over responsibility for the defense of Rangoon and southern Burma, using Toungoo as its base. Capt Yasuhiko Kuroe, who was promoted from command of the 3rd Chutai to Executive Officer of the Sentai during March, used this aircraft during the month in a number of battles with RAF fighters and USAAF B-24 bombers. On March 31, Kuroe was leading a flight of Ki-43s that ran into a formation of 7th BG Liberators. Kuroe and his wingman attacked the 9th BS's formation, shooting down a B-24. Return fire from the other bombers damaged Kuroe's Ki-43, but he managed to land safely. Capt Kuroe was instrumental in developing the tactics employed by JAAF fighter units against four-engined American bombers. (Cover artwork by Gareth Hector)